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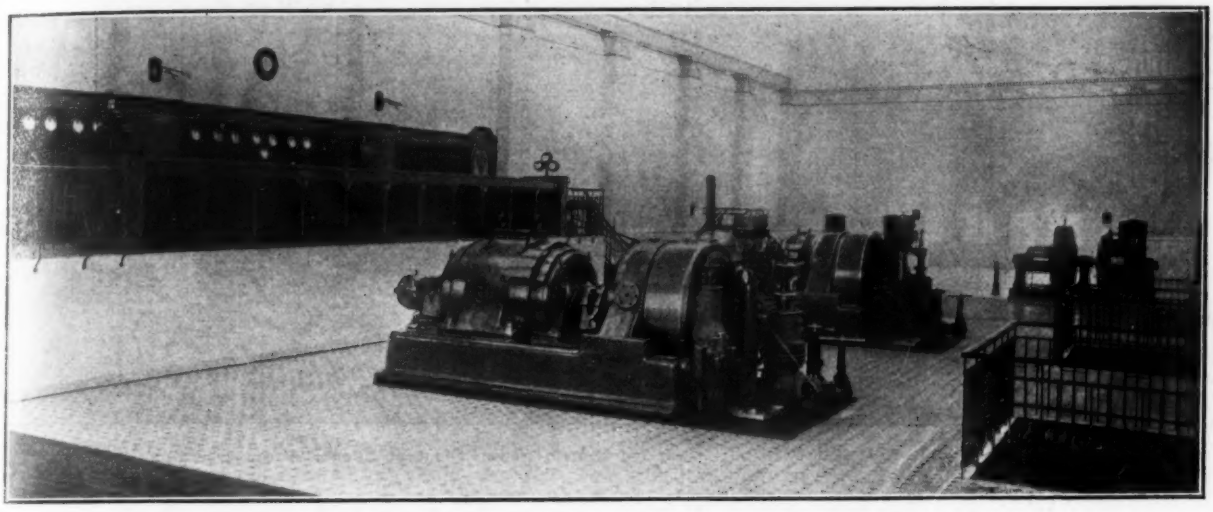


High-Pressure and Low-Pressure Steam Turbines at Offenbach, Germany.

Exhaust-Steam Turbines to Increase Power-Plant Capacities

Urgently Needed Increased Plant Capacity May Often Be Obtained by Installing Low-Pressure Turbine Units—Careful Analysis of Conditions Necessary—Operating Methods Used

By C. A. TUPPER

AMONG the managers, superintendents and engineers of central stations and industrial works a more active interest has been aroused, of late, in the possibilities of exhaust-steam turbines for increasing the capacities of existing electric generating plants, and this subject is now particularly to the fore both on account of the difficulties and cost of obtaining fuel and the expense and long delays involved in ordering complete new power units.

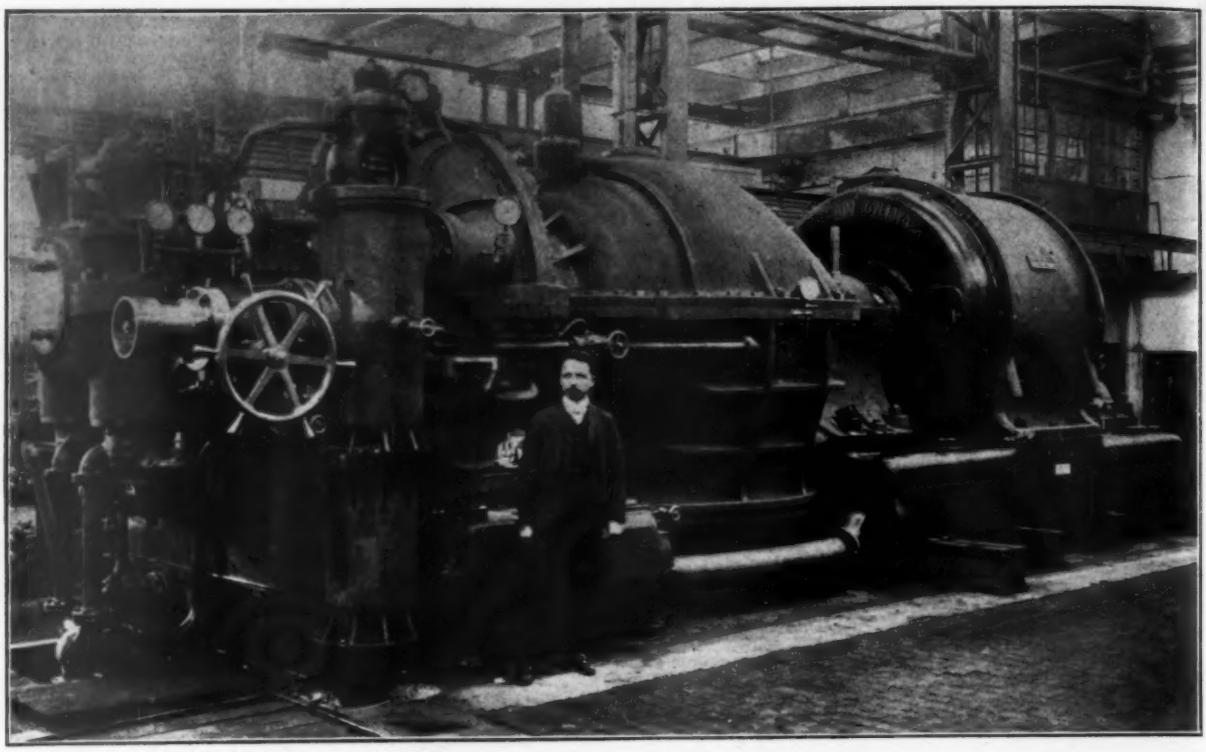
From the practical operating standpoint, however, there are numerous conditions to be taken into account when considering the net economy of using such turbines, and the type of machine to be recommended is important. This question is one that can be answered with any degree of certainty only after a thorough analysis by competent engineers of the layout and service conditions of the particular plant involved. In cases of intermittent but periodically regular operation for industrial works, as in steel mills where reversing engines are used, in mine or quarry hoisting plants or in other places where there is little to be gained by running condensing, the usefulness of the exhaust-steam turbines has been demonstrated in a very spectacular manner, but for electric generating units, compressors, direct-acting pumps and pumping engines, etc., where the steam cylinders are ordinarily connected to condensers, the determining factors include particularly the following.

ELEMENTS TO BE CONSIDERED IN ANALYZING THE PROBLEM.

(*a*) Present arrangement of the plant or group of plants, with all dimensions affecting the installation of additional machinery and auxiliaries.

(*b*) Number and types of boilers; systems of feeding and stoking; normal working capacity; safe maximum capacity; condition of boilers and probable life; facilities afforded by the boiler plant for expansion or vice versa; steam pressure carried; superheat.

(*c*) Type and rated capacity of each steam unit; if reciprocating, whether simple, compound or triple; if high-pressure, whether impulse, reaction or com-



Brown-Boveri Mixed-Pressure Turbine Built for Central Power Plant at Buenos Aires, Argentina.

bined system; receiving and exhaust pressures; condensing or non-condensing.

(*d*) Continuous overload capacity of each steam unit, considered with generators, if any; temporary overload capacities; steam consumption per unit of power.

(*e*) Character of service in each case, whether steady, periodic or intermittent, and frequency of exhaust.

(*f*) Condition of each steam unit; probable life.

(*g*) Number and character of steam auxiliaries; their steam consumption; exhaust available from auxiliaries; condition of each auxiliary and what proportion of capacity is utilized.

(*h*) Quantity of steam used for heating, oil-burner mixers, gas producers or other purposes about the works, and how taken.

(*i*) Total volume of exhaust steam available for each of the 24 hours of the day.

(*j*) Probable or possible need of regenerator; necessity of providing for use in low-pressure system of some live steam.

(*k*) Character of condensing system installed; altitude of plant above sea level; character of condensing water, salt or fresh, clear, acid or muddy; quantity available; high and low-water conditions; maximum, mean and minimum temperatures of injection water; possibilities to be taken advantage of in cooling; vacuum obtained and attainable; gain in efficiency from condensing system compared with expense for securing such efficiency.

(*l*) Fluctuations in demand for power and its range during different periods of the day.

(*m*) Electric service included in the existing system, whether alternating or direct current, or proportion of each; how apportioned among units.

(*n*) Volume and character of additional power required; how it is to be distributed among the regular operating departments of the users and auxiliary service, such as pumping, compressing air, haulage, driving tools, etc.

(*o*) Cost of high-pressure unit or units, basis purchase, maintenance and depreciation.

(*p*) Cost of low-pressure turbine unit or units on same basis.

(*q*) Value of retaining spare unit or units, or providing for additional "stand-by" machines.

(*r*) Probable growth in demand for power, year by year, as far ahead as can reasonably be estimated.

(*s*) Possibility of developing natural power in vicinity, as from underground gas or water-fall.

(*t*) Opportunities for utilizing fuel wholly or partially wasted, as blast-furnace or coke-oven gas, nearby colliery refuse, etc.

(*u*) Cost of additional power and net reduction or increase per horsepower-hour for entire system, from installation of exhaust-steam turbine as compared with other possible arrangements.

This analysis, of course, involves a mass of detail to be gone over, and in many cases the conditions favoring exhaust-steam turbines will be so obvious that only a few of the questions need be answered before a decision is reached. Nevertheless, it will pay to carry such an examination of the power system through to the end, for the analysis cannot help but be of value in many ways. Too many power plants are laid out or extended with only a limited knowledge of essential conditions and without proper regard for the future.

As a general rule, it is safe to assume that in power plants of any size where two or more high-pressure units are installed—or even one large unit—an exhaust-steam turbine can be utilized to advantage in securing needed increase in capacity; but in a small plant equipped with only one engine, which has perhaps seen years of service, wisdom will often dictate the purchase of a new compound condensing engine or standard high-pressure turbine and retaining the

old engine to help out on overloads or serve as a reserve unit.

Importance of High Vacuum.

In this connection it should be remembered that the effective range of pressure in an exhaust-steam turbine is small, rarely more than 15 pounds; hence a good vacuum is of far greater importance than with any other type of steam-power generator. As an illustration: the available energy in steam at 16 pounds absolute is 22 per cent less expanded to only 26-inch vacuum than if a 28-inch vacuum is secured. Accordingly, unless a vacuum equivalent to at least 26-inch (not absolute but referred to a 30-inch barometer) can be economically maintained, the installation of a low-pressure turbine is hardly warranted unless under exceptional circumstances. Moreover, the condensing system must be reliable, as exhaust-steam units do not operate without vacuum.

In judging the relative merits of engines and turbines, it is a common fallacy to compare the results from a turbine operating under very high vacuum with those obtained by an engine with a poor vacuum. In the case of a low or mixed-pressure turbine it is especially important to avoid any erroneous comparison of this kind. To maintain the same degree of vacuum, when condensing a given weight of steam under similar conditions, will cost practically the same in power and equipment, whether such steam be exhausted directly to the condenser from a high-pressure engine or turbine unit or first passed through a low-pressure turbine. This, therefore, is a problem to which close attention should be given; but all of the factors enumerated above, separately and together, ought to have careful consideration if the best possible results are to be secured.

For the operation of a low-pressure turbine in conjunction with one or more reciprocating engines, one of four general methods is commonly employed. These, in turn, may be subject to various modifications, depending upon local conditions. They are:

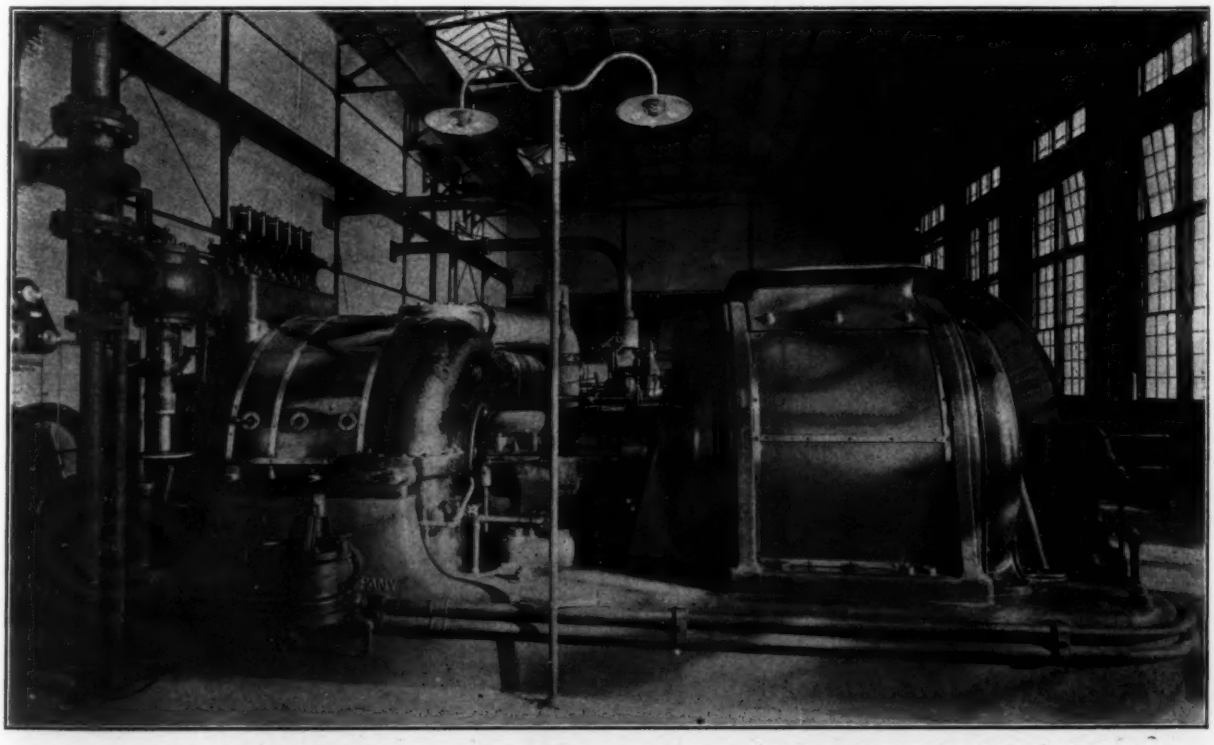
Methods of Operating Exhaust-Steam Turbines.

(1) Where the load on the engines is comparatively steady and the complete utilization of all the exhaust steam is not essential, but an approach to this condition is desired, the engines are run with a back pressure, limited by a suitable valve, and their exhaust is admitted to the turbine under governor control. This method accommodates itself to almost any class of power generation, although it does not permit the attainment of the highest possible efficiency.

(2) Where conditions are somewhat similar to those last mentioned, but circumstances render it impossible to install low-pressure turbine capacity sufficient to utilize as completely the full quantity of the engine exhaust, the low-pressure turbine may be adjusted, by means of a suitable valve, to take a constant quantity of steam at a constant initial pressure, and thus to carry a constant load, the excess exhaust being discharged into the atmosphere through a back-pressure valve.

(3) Where the engine and turbine operate jointly on the same load, the division of which between these two elements of the combined unit being automatic and the turbine having no separate governor but directly receiving all of the steam exhausted from the engine at varying pressure; the conditions are as stated further on.

(4) Where the operation of the engines is intermittent, as in steel rolling mill and mine hoisting service, but would rarely be the case in a central station, the engines exhaust against a practically constant back pressure into a receiver or "regenerator," to which live steam is admitted through an automatic reducing valve, and in which a constant steam supply for the use of the turbine is thus maintained, even though the interruption in the supply of exhaust steam from



Curtis Mixed-Pressure Turbine and 2000-Kilowatt Generator Installed at Galena, Ill.

the engines should extend beyond the maximum period for which the regenerator has storage capacity.

The Receiver or Regenerator.

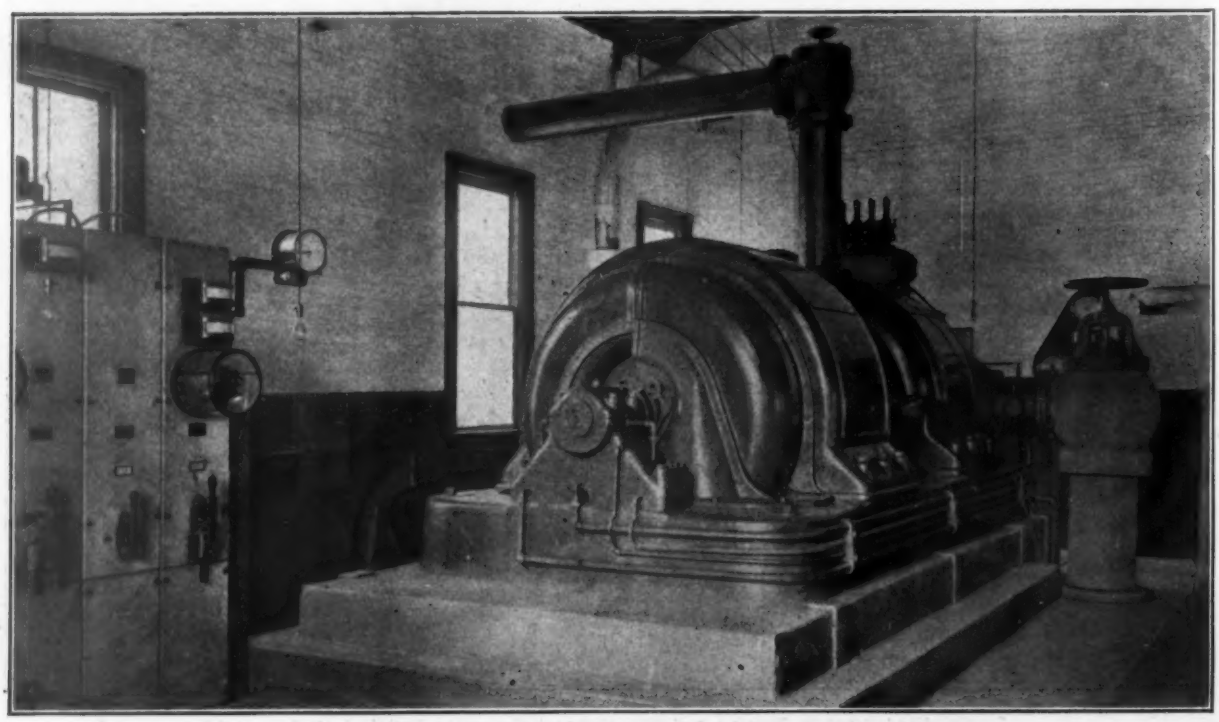
To illustrate the action of a regenerator the following case may be given, as it will be useful where regenerator service needs to be considered.

Assuming that the pressure limits for its operation are 14.7 pounds and 25 pounds absolute, that is, atmospheric pressure and 10 pounds gauge, the corresponding temperatures will be 212 and 240 degrees Fahrenheit, the difference between which is 28 degrees. Assume that the water with which the regenerator is partially filled is at 212 degrees and the steam at a corresponding pressure; the steam delivered by the reciprocating engine is then exactly equal to the demands of the low-pressure turbine. So long as this condition exists the steam flows through the water in the regenerator and no heat is taken up or given out. Now assume the load on the engine, and consequently the quantity of steam it exhausts, to increase, while the demand of the turbine for steam remains constant. Then the pressure within the regenerator and consequently the temperature of the steam will begin to rise, resulting in an increase in the temperature of the water, if provision has been made for intimately mixing the steam with it. As the pressure increases, the steam comes in at a temperature higher than the water and is in part condensed, which tends to maintain a temperature in the water corresponding to that of the steam. This process may continue until the pressure within the regenerator reaches 25 pounds, at which point a relief valve is set. Under these conditions, each pound of water within the regenerator will have absorbed 28.3 heat units. Now suppose the flow of exhaust steam from the engine to cease; then the pressure in the regenerator will begin to fall, because the turbine continues to draw steam from it. When this pressure has reached 14.7 pounds the water in the regenerator will have evaporated until its temperature corresponds to that of steam at this pressure, 212 degrees, and each pound of water in the regenerator will have given out 28.3 heat units, exactly equivalent to the amount absorbed while the pressure was rising. The mean latent heat of evaporation through this range being 961 units, each pound of water so reduced in temperature will liberate 0.0094 pound of steam.

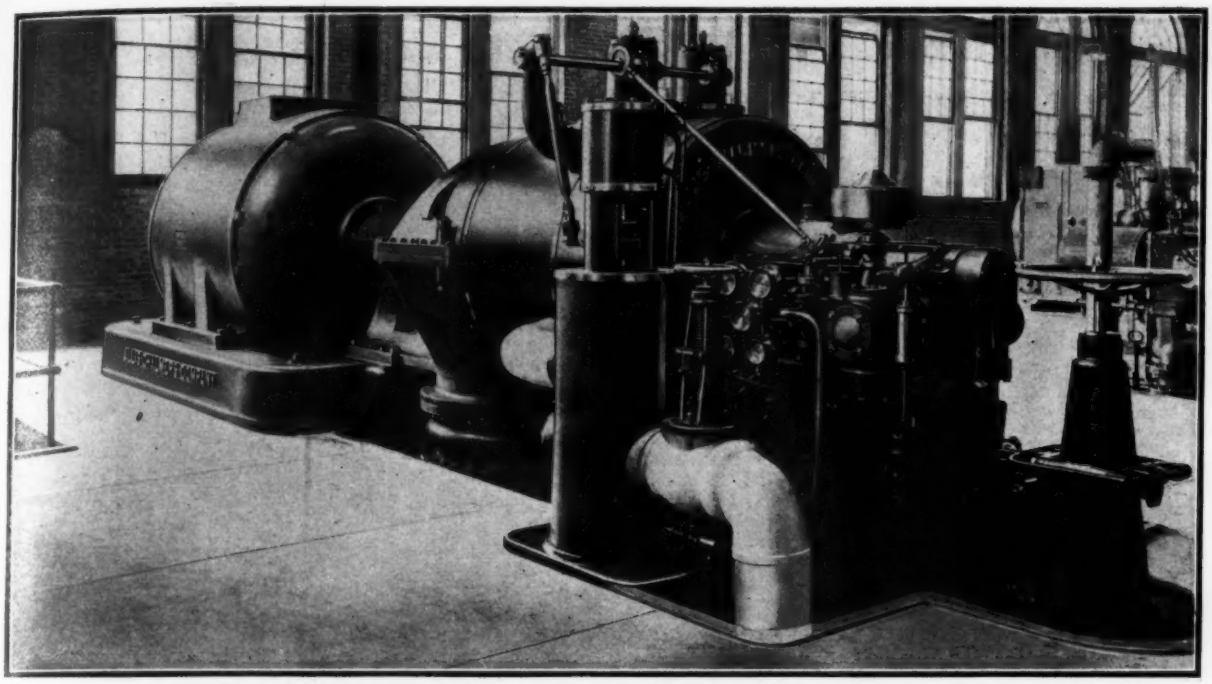
In installing a regenerator one of the most important points to determine is the length of time it will be required to carry the full turbine load without any supply of steam from the engine or engines; for if this is apt to be of long duration, the quantity of water in the regenerator must be correspondingly great. However, the pressure limits assumed in the example cited are quite wide. In a good many installations it would not be possible to impose 10 pounds back pressure on the engines. Frequently, in installing a regenerator, the disposition is to make the time element much greater than necessary.

Operating Method Usually Employed in Large Electric Power Plants.

For large power systems the most important of the four general methods of operation mentioned in the foregoing is where the engines and turbine or turbines installed together drive electric generators connected to the same busbars, the turbine unit or units being "floated on the line." This means that the engine and turbine sets are tied together electrically, the turbine in each instance operating without governor regulation. It has only a safety stop to prevent running away in case of an accident or some unusual condition. With this method the back pressure on the engine and the inlet pressure to each exhaust-steam turbine are always equal to the release pressure in the engine low-pressure cylinders less the drop to overcome port and pipe friction, and they rise and fall with the load, the two units automatically dividing the load between them. The speed regulation is effected en-



Curtis Mixed-Pressure Turbine and 750-Kilowatt Generator in Industrial Plant at Mineville, N. Y.



Allis-Chalmers 1000-Kilowatt Low-Pressure Turbine and Alternator Unit at Akron, Ohio.

tirely by the governors of the engines. If the electric current is alternating, its frequency holds the engine and turbine units to speed. If direct current is being generated by the engine set or sets and alternating current by the turbine set or sets, all being connected to the same circuit through a rotary converter or motor-generator set, the speed control is effected by a division of the load.

For example, if a change of station load results in the turbine running ahead of the engine—taking a pair of machines as a convenient illustration—the slight increase in its speed causes it to carry a greater share of the load, reducing the pull on the engine. The latter then speeds up, cuts off shorter and, by so doing, reduces its exhaust pressure and therefore the initial pressure at the turbine, causing the turbine to slow down slightly and to throw part of the load back on the engine. This automatic adjustment of loads takes place with such slight variations that no "see-sawing" of load or speed is noticeable, although slight but harmless cross currents may be perceptible in the switchboard instruments.

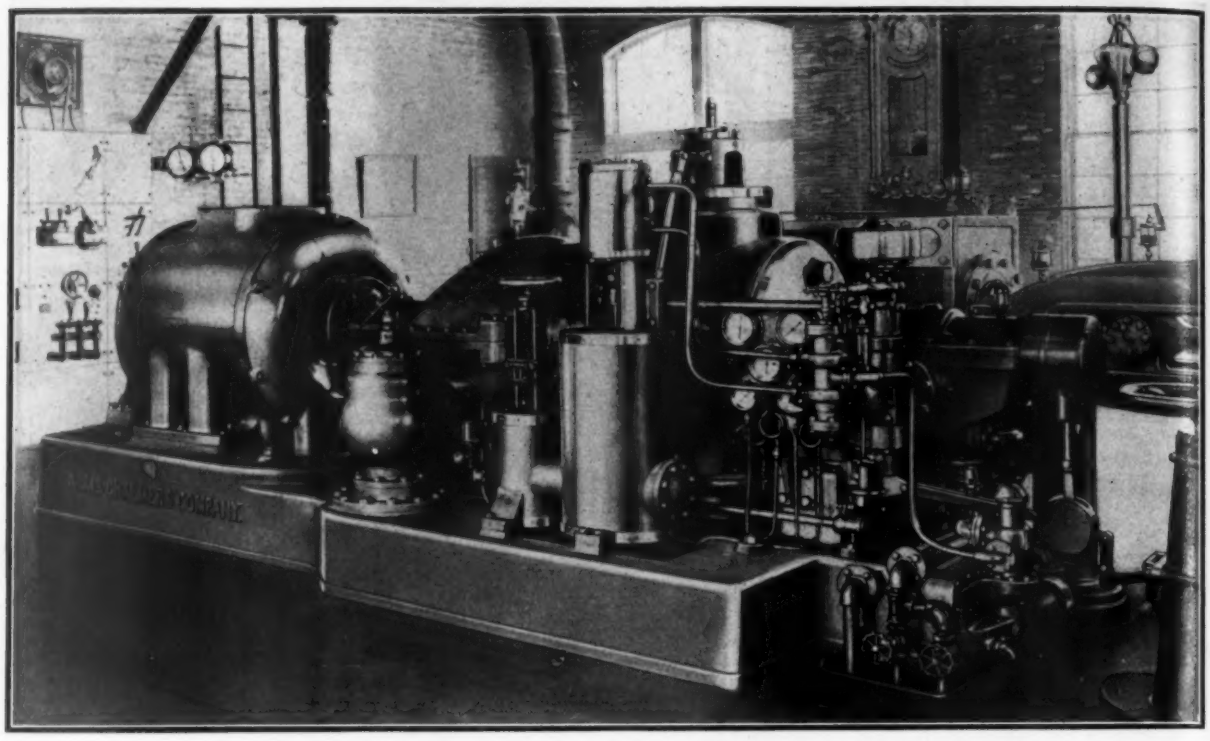
Even though intended to operate without governor control, the provision of a speed-regulating governor, entirely distinct from the automatic overspeed stop, is advisable. It will permit the turbine to be operated with live steam as an independent unit, when desirable or necessary, and it may be so adjusted that, in the event of the failure of the engine governor, it will hold alternating-current units at a speed slightly in excess of normal, yet below that at which the automatic stop would act, and will thus avoid any interruption of service by merely transferring the speed regulation from the engine to the turbine. In plants of any considerable size it is often desirable, also, to install one low-pressure turbine for each engine, with a separate condenser for each of these pairs. Each engine-turbine unit will then be comparable to a simple engine which has been compounded by the addition of a low-pressure cylinder, as is occasionally done in mill practice, the only difference being that the two portions are tied together electrically instead of by a common driving shaft.

With engines and turbines driving electric generators of different characteristics, as above referred to, a combination of mechanical and electrical connection is to install a synchronous motor-generator, driven directly or by belting from one of the engines operating a direct-current generator. This machine will act as a balancer, serving as a motor to give energy to, or as a generator to take energy from, the direct-current system. Naturally, it must have sufficient capacity for the maximum unbalancing of the direct and alternating-current loads. Such a device can also be used where the engine is a prime mover for shafting or belt or rope drive to apparatus other than electrical and the exhaust-steam turbine set furnishes current for motors and lights. The variety of applications possible will be obvious.

A fifth method which might be referred to is that involved where the turbine cannot be made to help out the engine load to any advantage, or vice versa, and the latter may not require as much exhaust steam as is sometimes available. The engines are then arranged for operating partially condensing. The turbine governor, which in this case is indispensable, controls a valve which by-passes to the condensing plant all surplus exhaust; and with no load on the turbine this valve remains wide open, so that the engine or engines operate with substantially full vacuum.

Mixed-Pressure Turbines.

In some plants there may be exhaust steam from intermittently operated engines, from various steam auxiliaries, such as compressors, pumps, etc., where the supply for a low-pressure turbine is insufficient or unavailable for any relatively small periods. Any turbine designed merely as a low-pressure unit will, however, be very inefficient in using live steam, since its expansive energy is wasted in throttling and only a small proportion is recovered from the resultant superheat. The conditions referred to are therefore



Allis-Chalmers 375-Kilowatt Low-Pressure Turbine and Alternator at Bay City, Mich.

met by providing what is known as a "mixed-pressure" turbine equipped with additional and distinct high-pressure stages in which such live steam can perform useful work in expanding from boiler pressure. The low-pressure stages are similar to those of the regular low-pressure turbine and to them the exhaust steam is admitted directly without passing through the high-pressure stages. The high-pressure and the low-pressure inlets are both automatically controlled by one governing device. Naturally, this type of turbine, when operating with low-pressure steam alone, is not as efficient as the simple low-pressure turbine, in consequence of the windage losses and dead load of the high-pressure element.

Manufacturers of leading impulse types of turbine have met this problem by building mixed-pressure units without using any additional wheels or buckets. This is accomplished with a separate set of high-pressure nozzles which direct steam to the same wheel as the low-pressure nozzles, thereby eliminating the friction, weight and windage of an extra high-pressure stage and also preventing the fluctuation in back pressure on the engine caused in the type above described.

The conditions which determine the selection of a low-pressure turbine or a mixed-pressure turbine relate solely to operation. Each type of turbine is generally built to be capable of carrying its full load, either with low-pressure steam alone or with live steam alone, as the boiler plant will naturally be proportioned to furnish sufficient steam to carry this load after such steam has passed through the reciprocating engine, the question of boiler capacity will not ordinarily affect the selection. The determining condition is the relation of the periods during which the turbine will operate with exhaust steam to the periods of using live steam. Unless the latter amount to more than one-third, say, of the aggregate operation on low-pressure steam, the standard low-pressure machine will, as a rule, be found preferable. In most combined engine and low-pressure turbine plants for central station or large manufacturing plants the operation of the turbine on live steam is an emergency condition, one such that a mixed turbine pressure need only be used where it will give better over-all economy.

Dr. Whitehead Invents Mine to Be Controlled and Discharged by Wireless.

After considerable experimental work in an endeavor to perfect a new type of mine, electrically controlled and discharged by means of a powerful wireless apparatus placed at a distance from the mine itself, a device which would enable one submarine to destroy another, Dr. J. B. Whitehead, of the Johns Hopkins University electrical department, is said to have brought his labors to a successful termination. The mine can be directed upon whatever course its operator may desire, and can be exploded by pressing a button, the wireless waves being employed both in directing it and in its explosion.

The advantage that such a mine would have over the ordinary torpedo used by the submarine lies in the improbability of failure to hit the target or of non-explosion after the target is struck.

Coal Pools Being Arranged.

As a result of a conference held by the committee on coal production of the Council of National Defense with shippers and receivers of coal in the Atlantic tidewater region, notice of which appeared in General Bulletin No. 306 of U. S. Chamber of Commerce, it is announced that bituminous coal amounting to about 36,000,000 tons a year will soon be pooled pending boat shipment at four Atlantic coast ports—New York, Philadelphia, Hampton Roads and Baltimore. On July 16 the program was first applied on some of the Baltimore piers.

Power Production and Distribution at Pullman Shops

Electrical Energy Generated in Three Power Stations Tied into One System—Service Extends to Eleven Large Shops—Notes on the Power Equipment

THE Pullman Company's works, situated at Pullman, in the southern end of Chicago, comprises eleven distinct shops, three power plants and numerous warehouses and other buildings utilized in the manufacture of steam railway and street cars. The work involves engineering, construction and repair-shop features, any one of which would serve as the subject of an interesting article. In these notes it is proposed to give briefly some of the essential facts pertaining to the power equipment for this large and important industrial plant.

One of the accompanying illustrations is that of the main power station, situated centrally for serving the principal shops. This is a well-finished brick structure, occupying a ground space of about 70 by 120 feet. The building contains three turbogenerator sets, with their accessories, and four air compressors; also, an overhead electric crane for use in installing machinery and making repairs. The interior views of this power house, given herewith, show the main power units clearly.

Main Power Station Equipment.

The unit shown first in the foreground is a General Electric turbine and generator. The turbine, which is of the high-pressure Curtis type, is driven at 1800 revolutions per minute and operates at 80 per cent power-factor. Direct-connected to the turbine is a 3125-kilovolt-ampere, 2300-volt, three-phase, 60-cycle generator. Accessory to this set is a Wheeler surface condenser. This combines a turbo-air pump, with condensate pump, and on the opposite end of the same shaft is a centrifugal pump for circulating water for the condenser.

The second and third units shown in the same picture consist of two Allis-Chalmers high-pressure turbines, with two barometric condensers. Each turbine drives a 2000-kilovolt-ampere, 2300-volt, three-phase, 60-cycle generator at 1800 revolutions.

Adjoining these is a 300-kilowatt synchronous motor, driving a direct-current generator for supplying energy to such variable-speed motors as may be operated best by direct current. The main exciter set consists of an Allis-Chalmers 90-horsepower motor, driving a 60-kilowatt, 120-volt direct-current generator. This is supplemented by a steam-driven, 60-kilowatt exciter.

Power Distribution.

Power in the main station, generated at 2300 volts, is transmitted throughout the works by three-conductor, lead-covered cables run within underground

View of Turbine End in Main Power House, Pullman, Showing Three Turbogenerators and Switchboard in Foreground, Four Air Compressors in Background.

clay ducts, to transformer vaults, from which the several shop groups are served. Current is thus transformed to 440 volts for power purposes and to 110-220 volts for lights. The eleven transformers, from which there are eleven feeder circuits, average about 375 kilowatts for power, and three to 25 kilowatts for lights. The transmission from the transformer vaults to the shop distributing panels is mostly by overhead okonite copper wire.

In the eleven shops there are 659 motors in service, ranging in capacity from 75-horsepower down to ½-horsepower. In most cases the motors are direct-connected to the machines served. Belt drives are employed in cases where several machines are advantageously operated in a group. The motor speed developed is as high as 1800 revolutions per minute, but the standard speed aimed to be maintained is 900 revolutions. About 4000 lamps are utilized for overhead and local shop lighting and for general lighting about the grounds.

The boiler house, in a building apart from the main power station, contains eight Stirling water-tube boilers, each of 414 horsepower capacity. Six of these are equipped with Green chain-grate stokers; one of the others has McKenzie stokers. The coal used consists of screenings and crushed coal. Link-Belt equipment for crushing and coal and ash conveying is used throughout. One boiler, however, is run exclusively on shavings from the woodworking shops.

Steam-Operated Air Compressors.

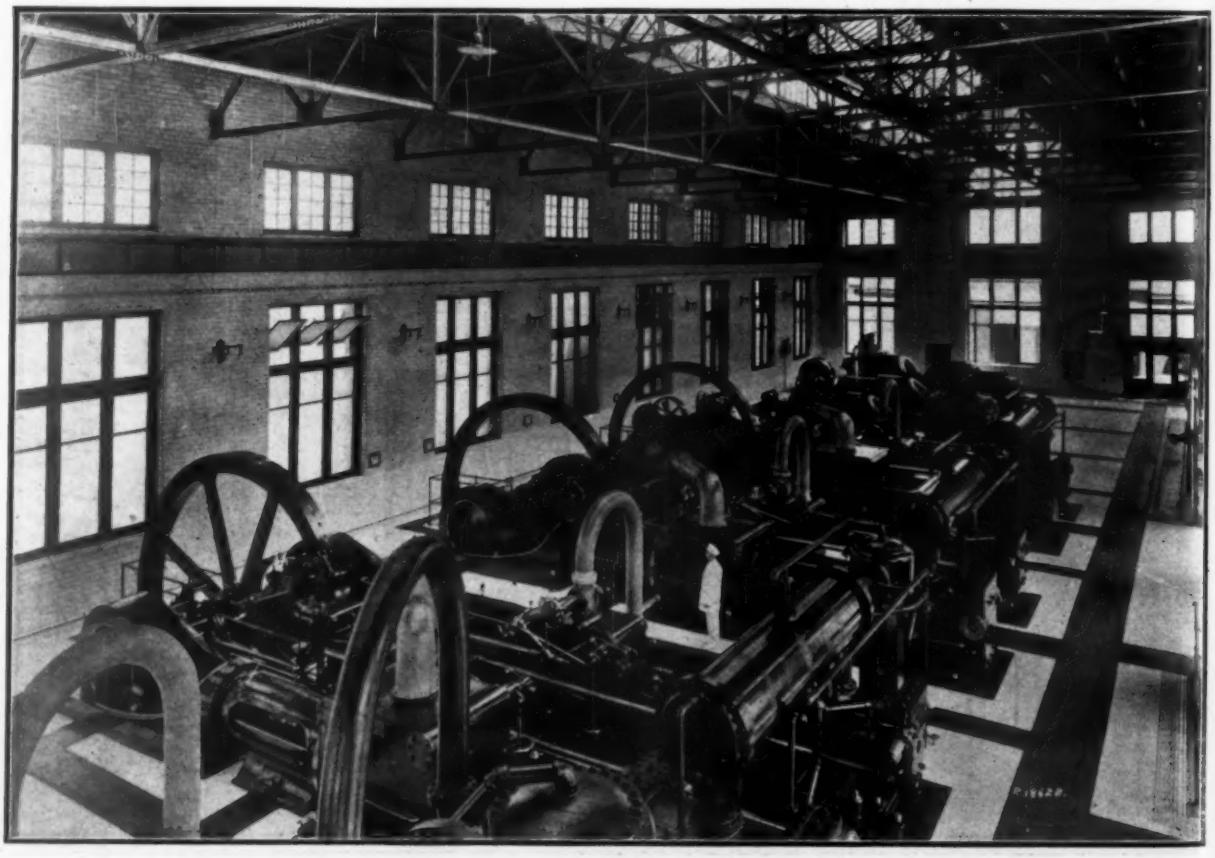
Reverting to the main power station, attention may be called to the illustrations in which four steam-driven air compressors are shown. Three of these are the Fulton type, each having a capacity of 4000 cubic feet of free air per minute; the fourth compressor is an Allis-Chalmers machine, of capacity of 6000 cubic feet of air per minute. All these are compound at the steam end and two-stage air end, of Corliss type. Compressed air is much used in some of the shops, for riveting and for other similar purposes.

The switchboard is on the main floor of the power station; the busbars and oil switches whereby current is sent to the transformer vaults are in the basement. The daily consumption of current from the main power house amounts to about 2700 kilowatt-hours.

Auxiliary Power Stations.

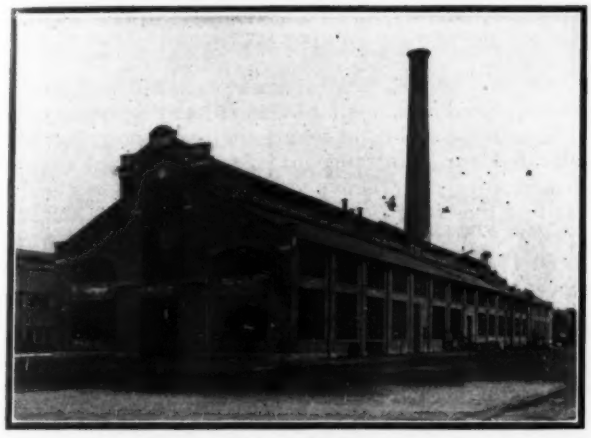
There are two other power stations. One of these, illustrated herewith, is in the northern part of the works, at 103rd street. At this plant are six Stirling boilers, 415-horsepower each; two Ingersoll-Rand air compressors, and one 500-gallon pump, steam-operated, for hydraulic power used in riveting and other heavy shop work. The feature of special interest at this station, however, consists of two Westinghouse 1200-kilovolt-ampere turbogenerator sets, with Le Blanc condensers. The electric power thus generated is interconnected with the system of which the main station is the center.

The other station, situated some distance south of the main station, is the Calumet, where a 250-kilowatt generator is driven by an Allis-Chalmers Corliss engine. While this power is also tied in with the general system, it is used mostly in the repair works on the shore of Lake Calumet. At the same plant is a 2000-cubic-foot capacity steam-driven air compressor, and one of smaller capacity, operated from steam



View of Compressor End in Main Power House, Showing Three of the Engine-Driven Air Compressors and the Three Turbogenerators in Background. Compactness of Latter Units is Evident.

Exterior of Main Power House.



Exterior of 103d Street Power House.

generated by two 350-horsepower Stirling boilers. A plant is maintained at Calumet station for charging the storage batteries on Pullman passenger cars for lighting purposes; also for battery charging on trucks and other equipment.

AUTOMATIC HOISTS FOR COAL AND ASH HANDLING, WITH PUSH-BUTTON CONTROL.

Economical and Safe Methods of Handling Materials in Bulk at Power and Industrial Plants.

Accompanying illustrations show the installation of some automatic coal and ash hoists with push-button control. Fig. 1 shows that of the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., and Fig. 2 that of the W. J. Rainey Company, Allison, Pa. The illustrations give an idea of the development in the way of an automatic skip, self-dumping and returning, for handling material in bulk from a lower to a higher level.

The material to be raised is dumped into the open top of a bucket which is supported and held in a vertical position by a separate frame running on vertical guides. Hoisting cables are attached to the upper part of this frame and led over sheaves to the drum of a worm-gear elevator machine. This machine consists of a steel-frame motor, a mechanically applied, electrically released shoe brake and a winding drum driven through worm and gear reduction, all of which are compactly grouped on a continuous heavy iron bedplate in order to preserve alinement. The angle-iron guides on which the bucket frame runs are fastened to the structure of the tower or hoistway in which the material is to be raised. The bucket is made of heavy steel plates and provided with two cams, one on each side. These cams are made of ordinary channel irons, properly shaped and riveted to the sides of the bucket. The bucket is supported in its frame by two trunnions, and is held in a vertical position and guided by two brackets bearing against the angle-iron guides, which are fastened to the steel tower.

As the bucket approaches the top of the tower, the cam on each side engages with a roller, which is mounted in a heavy casting fastened to the framing of the tower. Each angle-iron guide is cut so that when the cams engage with the rollers, the brackets no longer bear against the angle-iron guides. This allows the bucket to swing out toward a dumping position. The action of the cams and rollers controls the swing of the bucket and gradually changes its position from vertical, causing it to tilt outward and downward until the material can freely slide out of the bucket into a chute, or hopper provided to receive the material. When the bucket has reached the dumping position the machine automatically stops, and remains stopped long enough to permit the bucket to be entirely emptied. This interval varies from two to ten seconds, according to the nature and quantity of material handled, and the equipment is provided with a simple adjustable timing device for obtaining this variation. At the end of this dumping interval the machine automatically starts in the reverse direction, the bucket regains its vertical position in the frame and travels down to the level from which it started, ready to receive another load.

The attendant who operates the hoist usually controls the delivery of material into the bucket. The

Fig. 1.—Automatic Coal and Ash Hoist at Plant of Consolidated Gas, Electric Light & Power Company.

operation of the hoist is simple. When once started by a pressure of the push button, the bucket proceeds to the top where it automatically dumps and returns to the starting position without further attention. This feature eliminates the expense of a special operator and avoids all damage due to inaccurate operation. The controlling device is arranged for either direct or alternating current, and is of the standard Otis patented full magnetic type, operated by push buttons conveniently located at the loading level. There is one button for up motion, one for down and one for stopping. After the selected button has been pressed, the rest of the operation, acceleration, stopping at the top and returning to the loading position is automatically taken care of. The stop button is

Fig. 2.—Automatic Coal and Ash Hoist at W. J. Rainey Company's Plant.

utilized to stop the bucket at any point in its travel should occasion demand; after such a stop, travel can be resumed in either direction by pressing the proper button.

This type of hoist is said to have a carrying capacity of from 1000 to 10,000 pounds, at a bucket speed from 50 to 100 feet per minute, depending upon the load carried. The machine can be located overhead or on the ground adjacent to the hoistway. These installations are provided with counterbalance weights arranged in the same manner as for regular elevators. This counterbalance is connected by ropes to the winding drum of the hoisting machine, and its use insures a smooth and steady operation, with a smaller machine and motor than would otherwise be required.

The application of this automatic equipment is not limited to a vertical hoist, but also can be installed where the conditions require the hoisting of material at an incline. In such a case the bucket is furnished with four wheels running on tracks. By using double flanged wheels and additional tracks at the top of the incline, the bucket can be dumped without the use of cams or rollers.

EXTENSIVE IMPROVEMENTS TO PLANT OF LINCOLN GAS & ELECTRIC LIGHT COMPANY.

New Coal and Ash-Handling Equipment Will Effect a Saving of Over $2000 per Year.

An extensive construction program is now nearing completion at the plant of the Lincoln (Neb.) Gas & Electric Light Company, which will place it well in the class of modern central stations.

A 2,500-kilowatt normal rated Westinghouse turbine with a No. 16 LeBlanc condenser is nearly ready to place in service. Two more bays and four forced-draft fans have been added to the present main cooling tower in order to provide for the additional circulating water capacity required.

The new $13,000 switchboard, located on the west side of the plant, which has been in service for several months, is modern in every respect, and will adequately provide for future extensions for several years to come.

A very notable improvement in the boiler room is the elevated coal spur and coal-handling equipment. The railroad siding adjoining the boiler room has been elevated for a distance of 285 feet to an extreme height of 9 feet above the ground level. The last half of the track is carried on concrete piers and steel girders. A concrete track hopper holding 100 tons has been provided underneath the trestle and into which the coal from the bottom dump railroad cars is discharged by gravity. Beneath this track hopper is a tunnel in which an industrial railway is operated. The 1,500-pound capacity industrial dump cars are loaded under the hopper and pushed through the tunnel onto an elevator where they are raised to an elevation of about 8 feet above the boiler-room floor. The cars are then pushed out over a steel trestle in the boiler room across a registering scale where every car will be weighed and then dumped by gravity into the stoker hoppers as required.

Engineer A. T. Hutchins advises that the equipment will save $2,000 per year in coal and ash-handling cost, besides providing a coal storage capacity of 2,500 tons and making a clean, tidy boiler room possible. An interesting feature of this whole coal-handling system is that it will cost, all completed, less than $8,000.

Another very important feature in the development of the plant is the installation of a rotating drum boiler feed-water meter of 100,000 pounds per hour capacity, which will be placed between the heater and the boiler-feed pumps. With daily coal weights and boiler evaporation figures the plant performance can be checked up very closely.

Hydroelectric Power Being Supplemented by Steam.

The International Railways Company of Buffalo is now receiving about 75 per cent of its power from Niagara Falls hydroelectric stations. The supply does not take care of the entire peak loads and the company has to supplement its water-power supply by its own steam-electric plants. With the acquisition of the new coal property, the company will be protected from any raise in coal prices and also be able to amortize the payment of the mine from earnings saved by the lower price of coal and the sale of its surplus production within a comparatively short time.

Editorial Comment

Federal Water Power Legislation

SENATE BILL No. 2399, introduced last month by Senator Walsh of Montana, provides for the issuance of government permits to private corporations or individual citizens, under which hydroelectric power may be developed on streams within the public domain. This bill is now in the hands of the Committee on Public Lands. It authorizes the Secretary of the Interior to issue such permits for terms of 50 years each, same to be irrevocable within that period, except by court proceedings instituted for failure to comply with the terms therein specified. The proposed permits would be granted for power sites and necessary holdings on any public land in the United States, including Alaska, except National Parks and military reservations; sites for hydroelectric development within National Forests are specifically included.

Preliminary permits may be granted for terms of one year to enable applicants to work up data required in outlining plans of developments and estimating costs. Permits are to be issued to those only who have complied with the laws of the state, states or territory wherein the proposed project is situated, as to appropriation of water for power purposes.

Under this bill, a power project lying within two or more states, or within a territory, is required to be operated under control of the Interstate Commerce Commission, as to rates of service to consumers. At the end of the 50-year term the Government is given the right to take over the project, compensating the lessee for the amount of his investment, or may renew the permit of the original holder, or may transfer the project by issuing a permit to a new party. In the event that no one of these three dispositions is made, then the original holder may continue in possession under his original permit. Any succession of the property, either to the Government or others, carries with it an obligation to execute all contracts for delivery of electric current which may have been made to extend beyond the original 50-year period.

Charges or rental for power sites and other holdings, under this bill, are to be fixed by the Secretary of the Interior and so specified in the permits issued. Of the funds derived from this source, 50 per cent is to be paid to the state within which the hydroelectric energy is developed and generated, and 50 per cem to the reclamation fund created by act of Congress, approved June 17, 1902. Permits issued to a state, a municipality, or in developing power for using timber resources on a national forest, are to be without charge; also, permits for developing not exceeding 25 horsepower to individuals or associations for domestic, mining or irrigation purposes are to be without charge.

In Section 13, all interference with the laws of any state relating to control, appropriation, use or distribution of water, is specifically disclaimed. This apparently implies that a state public service commission may enforce its regulations.

The Walsh bill is the fifth measure which has been presented to Congress within the last four years proposing to place the control of the unappropriated water-power resources of the public domain under federal authority. The four which preceded the Walsh bill consisted of two House bills and two Senate bills. The Shields bill, a Senate measure, aimed to deal with power development on navigable streams; it passed the Senate but in the House the Adamson bill was passed as a substitute for it. The Adamson bill required a special act of Congress to authorize a company or individual to develop power on any stream in the public domain, and specified that all rights to the property thus developed should cease at the termination of the lease. The Ferris bill, a House measure, proposed to confer special discretionary and arbitrary power upon the Secretary of the Interior, offering scant and uncertain recourse to the investor at the close of the term of lease. This bill passed the House but when it reached the Senate the Myers bill was passed as a substitute for it. The latter bill provided that at the end of the 50-year term of lease the lessee might continue in possession under the terms of the original lease in the event that the Government did not take over the project, nor negotiate a new lease. Thus, provision was made against a lapse of title or a cessation of operation. The Adamson and Ferris bills, had either one become a law, surely would have had the effect of retarding hydroelectric development, because persons having money to invest in such projects would not accept terms and conditions imposed. The Shields bill placed the leasing of power sites on navigable streams in the hands of the Secretary of War, and the supervision of rates and service in the hands of the public service commission of the state, where the service was intrastate and where it was interstate the Secretary of War controlled regulation. But it contained no provision for the development of power on non-navigable streams.

This brief review of the four preceding measures is of interest, as showing two divergent attitudes that crystallized in Congress pending this proposed legislation. These opposing views really grew out of the contest waged a few years ago between the ultra-

conservationists, who demanded federal control of power resources, and those who advocated state control. The latter were most strongly in evidence in the western states wherein the major part of the unappropriated water-power resources exists, and the most radical of the federal control advocates were in states having little of such resources to conserve. However, the weight of national public opinion seems to support federal supervision, and the Walsh bill, by its equitable provisions for safety and fairness toward investors, and its adequately safeguarding the rights of consumers,. will go far toward harmonizing the opposing forces in and out of Congress. Under the existing demands for power and the shortage of coal supplies, there would seem to be good hopes of the Walsh bill becoming a law. With such a bill enacted into law, one of the first of interests to develop hydroelectric power under its provisions probably would be the railroads.

Hurley Heads Shipping Board

IT would be difficult to conceive of a happier solution of the steel-wooden vessel controversy than has been found in the appointment of Edward N. Hurley as chairman of the Shipping Board. His service as chairman of the Federal Trade Commission advanced the work of that body, within a few months of organization, to a position seldom reached in years by governmental departments in any nation. "Co-operation" and "teamwork" were the keynotes of his success, and there can be no question but that the same efficiency which they brought about in the work of the Federal Trade Commission will soon be applied to that of the Shipping Board.

The effect of this upon speeding up shipbuilding to replace tonnage lost through submarine destruction should be immediate and pronounced.

There is, however, a larger aspect to the possibilities opened up by Mr. Hurley's leadership in providing means for exporting American products, and that is in the situation following the war.

On that point, in speaking of our present lack of shipping and lack of organization for foreign trade, Mr. Hurley himself is quoted in *International Trade* as saying that the outstanding fact which confronts us is this: When we buy abroad under normal peace conditions we are at the mercy of the foreign seller, and when we sell abroad we are at the mercy of the foreign buyer. In the language of the street, they "get us a-comin' and a-goin'." And the reason is that the European industries are organized scientifically to capture foreign trade and to get all there is out of it, while we in America have suffered the consequences of this one-sided organization.

Competition is the same the world over, and it will be particularly keen when the business of peace is resumed among the nations. America's chance at the trade of the world will be helped beyond what it was before by reason of a new, even start with the others in the race, but we must be prepared to match systematized industry against the effective systematized industries of our competitors.

In this country we have placed ourselves at a decided disadvantage by a refusal to adopt co-operative methods and thereby strengthen our position against our great competitors in foreign countries. In Germany, for example, men engaged in particular lines of business, meet around a table and discuss their business questions. They feel the unity and strength which comes from their common interest on account of all being German; they feel that the country of which they are citizens must be considered first of all, and that whatever is done for their respective industries is done for the good of the whole country. We need more of this spirit of unity in the United States, and with effectively developed trade associations we can not only raise the level of efficiency in this country but make ourselves effective competitors in the markets of the world. By competitors frequently meeting with each other in electrical and other trade associations, a better feeling will be created and we will soon find that manufacturers are working together not only for their industry, for their employes, for their stockholders, but for the country as well.

One of the real needs among American business men today is a broad view of business and a comprehensive grasp of industry as a whole. Too many American manufacturers and merchants center all their energy and attention upon their particular establishment and the work of making profits for it. Men at the head of electrical works and other factories need the point of view of what might be termed the *statesmanship of business*. They need to appreciate the fact that their plant is only a part of a great industry; that their individual welfare depends very largely upon the welfare and progress of the whole industry, and of industry in general.

The men who realize this principle, who are studying our economic problems from this point of view, are the men who will do the big things and be the real leaders of American business.

The points which Mr. Hurley brings out, as quoted above, apply with especial force to shipping conditions after the war. Tonnage now considered solely with reference to the needs of our allies and our army in France will then be available for carrying the commerce of peace. How and by what interests the vessels are to be used, at what rates and under what conditions of seamen's labor, treatment, etc., are problems that will demand wise, far-seeing, unpartisan solutions. No man in public life today is better fitted to cope with them than Mr. Hurley. His appointment represents well-merited recognition of himself, is an honor to the electrical industry to which he belongs as a manufacturer and does credit to the wisdom of the President who selected him for this most important post.

Edward N. Hurley,
Chairman of the Shipping Board.

HAPPENINGS IN THE INDUSTRY

New Toledo Power Station to Embody Many Unique Features—Position of Central Station in War Time—St. Louis Jovian League Holds Excursion—New Physics Laboratory at Madison Completed

NEW TOLEDO PLANT TO EMBODY MANY UNIQUE FEATURES.

Original Installation Will Comprise Two 20,000-Kilowatt Turbogenerators with Latest Auxiliary Apparatus.

Many unique features will be embodied in the new East Toledo generating station of the Toledo Railways & Light Company which is now under construction. The original plant will contain two 20,000-kilowatt General Electric turbines. The first one to be installed this fall will be a 13-stage machine, designed to operate on 225 pounds steam pressure and 150 degrees superheat. At full load and with 28½ inches of vacuum the steam consumption will be 11.65 pounds per kilowatt-hour. At three-fourths load 11.6 pounds and at half load 12.05 pounds per kilowatt-hour.

The second machine to be installed in May, 1918, will have 23 stages, and under the same conditions as above will give a slightly flatter water-rate curve. The water rate at full load will be 11.6 pounds per kilowatt-hour, at three-fourths load 11.25 pounds and at half load 11.8 pounds.

Both machines will generate 25-cycle, 3-phase, 6,600-volt current, and each will have an exciter direct-connected to the main turbine shaft and generating at 250 volts.

The condensing equipment will consist of Wheeler Condenser & Engineering Company surface condensers. The condenser for each machine will be cylindrical in shape and will contain 31,000 square feet of surface made up of one inch by 20 feet 6 inches long, No. 18 seamless drawn-brass tubes. Twelve hundred square feet of this tube surface will be partitioned off as an internal Volz heater for maintaining the condensate temperature within five degrees of the exhaust-steam temperature.

The condenser is bolted rigidly to the turbine exhaust opening, and is supported on steel springs placed underneath the condenser, thereby allowing for expansion and contraction.

The circulating water to and from the condenser will operate as a closed-siphon system, thereby reducing the actual head on the pumps to a minimum. The circulating water pump for each condenser will consist of a 36-inch double suction Wheeler centrifugal pump, having a capacity of 40,000 gallons per minute, and a pumping head of 22 feet. Each pump will be driven on one end by a 275-horsepower Kerr turbine with ten to one ratio gears, and on the other end by a 250-horsepower normal rated induction motor. Either drive can be used as the occasion requires.

The circulating water pumps for the first two units will be made still more flexible by being tied together on the discharge side by means of a 36-inch cross-over connection. The sectionalizing valves on this connection will be motor-operated.

The air pumps are of the Wheeler Roturbo type, each direct-connected to and driven by a 90-horsepower Kerr turbine. In order to avoid using raw water in air pumps, each pump will be provided with a base cooler constructed somewhat similar to a surface condenser and containing the air-pump water suction and discharge connection, thereby operating as a closed system. Condensate will be used in the air-pump water-circulating system, and cooled in the base cooler by passing through it 1,000 gallons per minute from the discharge side of the circulating water pump.

The guarantee provides that the air pump hurling water will be maintained within two degrees of the circulating water temperature.

The condensate pumps will be of the Wheeler double-suction type, each direct-connected to and driven by a 45-horsepower Kerr turbine.

THE POSITION OF THE CENTRAL STATION IN WAR TIME.

President Bechstein of Ohio Electric Light Association Discusses Problems before Annual Meeting at Columbus.

The annual meeting of the Ohio Electric Light Association was held in Columbus, O., July 19. This took the place of the customary annual convention which was to have been held at Cedar Point, O., July 16 to 20. President E. A. Bechstein, of Sandusky, in his address to the convention commented on the problems which are confronting the central-station companies of the country. An abstract of his address is given in the following paragraphs.

With our country at war, the electrical industry is confronted with conditions and obligations it has never before encountered. We are not only face to face with operating conditions that will tax the ingenuity of the best of our men to meet, but we also have a greater measure of responsibility thrust upon us than ever before.

Our part in the war will be no small one. It will be our duty to supply the wheels of industry with power in order that those who are making the things needed for the men in camps and at the front may perform their work efficiently. We must also furnish a large part of the power to transport food, supplies, munitions and men to the places where they are needed. The constructive forces of the country are co-ordinating as they never have before, and the failure of even one part of the great industrial machine may cause delay and loss to all other parts. From a small central station in Ohio to the battle lines of France and Belgium is a far cry, but the failure of even the smallest station to perform its duty at a critical moment may mean the loss of many lives and prolong the struggle in which we are engaged. So the year to come will call for greater efforts, greater vigilance, greater co-operation than ever before. The

loyalty of the men of the industry has already been demonstrated in their liberal subscriptions to the Liberty Loan and Red Cross, and it will be demonstrated time and again as the calls of national necessity arise. But it is not enough to be merely loyal. We must work as we never worked before in order to "hold up our end" in the great struggle.

Operating Conditions.

Near the beginning of the present calendar year the entire industry was thrown into a state of confusion by a sudden, sharp advance in the cost of labor and materials. This came so unexpectedly that there was not opportunity to prepare for it; and for a time it was a serious question whether or not a considerable number of stations would be obliged to shut down. The advanced cost of fuel was particularly distressing, that essential commodity doubling in price almost over night. With the increased cost came a vexing uncertainty about deliveries. Many of us led a hand-to-mouth existence with regard to fuel for several months; and some of us did not know at times but that we might be forced to suspend operations for lack of ability to get coal at any price. In some sections, also, it was next to impossible to procure and hold labor. This condition still exists, and one of the big problems ahead of us is to find a way to overcome this serious handicap.

There remain the problems of labor supply and deliveries of fuel and other essential supplies. As to the former, little can be done until the reorganization of all industries has made further progress in this direction.

As to deliveries of fuel, it seems to me that some means of insuring them to all central stations should be devised. We are providing a service of such vital importance to every other branch of industry, a service upon which practically the whole population of the state depends for employment, a service, the interruption of which may be fraught with loss of individual health, comfort and efficiency—a service, in short, so assential to the welfare of every individual—that it is perilous to leave us in any uncertainty in this respect.

Commercial Conditions.

During the greater part of the fiscal year commercial conditions have been good. Indeed, new business has come to some of the member companies so rapidly that they have been at a loss to find means of taking care of it.

Owing to the congested condition of all factories making electrical and other machinery, equipment and supplies, with the consequent delays in deliveries, some of the companies have found it very difficult to keep pace with the increased demand for service. In some instances, I am informed, all advertising and solicitation has been suspended. I cannot help feeling that this policy, especially as it pertains to advertising, is risky. Advocates of municipal ownership are very quick to take advantage of the silence of a utility company. Where there is no occasion for commercial advertising it seems to me it would be a good idea to utilize newspaper space for educational work. I think, too, that sales organizations should be kept intact, as far as possible, for the reason that a sudden change of conditions, which no one can foresee, makes it desirable to have such an organization available for immediate use, as has been demonstrated in the past.

ST. LOUIS JOVIAN LEAGUE HOLDS RIVER EXCURSION.

Over 2000 in Attendance—New Officers Elected.

Nearly two thousand people, including Jovians, their families and friends, attended the river excursion held aboard the Steamer Alton, at St. Louis, Friday evening, July 20, by the St. Louis Jovian League. The event marked the retirement of E. H. Waddington as chairman of the entertainment committee after a service of three years. The large attendance was in part a tribute to the splendid service that Mr. Waddington has rendered the league, and was brought about by the activity of two competing ticket-selling teams known as the "Recruiters" and the "Conscriptors," headed by Fred Johnson of the Wagner Electric Manufacturing Company and E. C. Johnston of the East St. Louis & Suburban Railway Company, respectively.

The contest developed into a very spirited one, the "Conscriptors" winning. They were served a banquet on board the excursion steamer by the losers, who were attired in waiters' aprons and regulation French-waiter mustaches and gotees.

More than $500 worth of electrical household appliances donated by local electrical firms were distributed as prizes during the trip.

The election of officers of the League held aboard the boat resulted as follows:

President, W. N. Matthews, president W. N. Matthews & Brother.

Vice-president, E. H. Waddington, sales manager Western Electric Company.

Secretary-treasurer, George McD. Johns, superintendent Fire Alarm System, St. Louis.

Executive Committee, Bruce Cameron, C. E. Ruffner, S. M. Boyer and Horace Beck.

NEW PHYSICS LABORATORY AT MADISON COMPLETED.

Powerful Wireless Station and Experimental Equipment Feature of New University of Wisconsin Building.

The new physics building at the University of Wisconsin, Madison, Wis., which was begun in the spring of 1916, is practically completed and will be occupied when the students return in the fall. All floors but the basement are ready, and the moving of departments has already begun.

The physics department will occupy the largest part of the building, with laboratories, lecture rooms, and offices, extending over three floors. The department of political economy will occupy the third floor, and the course in commerce will have the fourth.

The building is more nearly fireproof than any other building on the campus. It is built of reinforced concrete with trimmings of brick and stone, and the sashes are all of steel. To insure still greater safety an emergency exit leads directly out-of-doors from the large lecture room which seats more than 350 persons.

The wireless station will be situated in the new building, and an aerial tower will be built on top of the hill with antennae strung to the new building.

A large physics museum in which apparatus for many common experiments will be set up permanently is a feature of the building.

NEWS NOTES

Civil Service for Electrical Departments—Governor Brumbaugh, Pennsylvania, has signed a bill establishing civil service for the electrical and engineering departments of third class cities in the state.

Boiler Code for New York—The Bureau of Industrial Code of the New York State Industrial Commission, with the assistance of a committee of experts, has adopted a uniform boiler code, effective July 1. The perfected code represents work and research during the past seven months.

Central Indiana Telephone Owners—The next semi-annual convention of the Central Indiana Independent Telephone Owners' Association will be held in Winchester, in October. This decision was reached at the closing session of the telephone men recently held. More than seventy telephone men attended the meeting.

Tax on Electric Energy, Mexico—President Carranza, Mexico City, has rescinded the former tax of ten centavos on each electric globe used in the country, and adopted a tax of 10 per cent of the cost of electric service for lighting to the consumer. On power service, a tax of 3 per cent has been imposed, based on the price paid by the consumer.

Commission Orders Lower Rate—The Michigan State Railroad Commission has decided in favor of Lake Linden in the latter's contest with Houghton County Electric Light Company for a lower rate. The commission ordered a reduction from 13 cents gross and 12 cents net, to 11 cents gross and 10 cents net, the new rate applying to the entire district served.

Peculiar Fire—Breakage of an incandescent lamp used on a cord to illuminate the interior of a distillery tank, ignited the alcohol-laden whisky fumes of a 5000-gallon tank at the Anderson & Nelson distillery at Louisville, Ky., and caused an explosion. One man was injured and slight damage done, although the fire was not communicated to 4500 gallons of whisky in the tank.

Publication on Safe Methods of Making Knots and Hitches in Rope.—The National Safety Council has issued Bulletin No. 6 entitled "Knots, Bends, Hitches and Slings," which gives descriptions for safely making these various loops in rope used for hoisting, hauling, etc. The bulletin has 62 illustrations giving a good idea of the exact form of the various knots, etc. Data are also given on safe loadings for ropes and chains.

Proposal of Traction Company Not Entertained.—Columbia, Mo., the home of the University of Missouri, has refused the offer of the Southern Illinois Traction Company to make tests and take inventory of the city water and light plants, with the view of making a proposal for supplying the city with energy from a transmission line from the Mississippi River dam. No expense to the city was involved in the tests and inventory, but the offer was refused on the ground that the report would not be acceptable unless the city provided an engineer to assist in the investigation and such an engineer's services would cost $3,000, which the city was not ready to spend.

Electrical Positions Are Created.—The City Council of Canton, O., has passed an ordinance creating the positions of chief electrical inspector and city electrician, paying $1500 and $1080 a year, respectively. The positions will be under the city civil service, and will be filled from an eligible list created through examination.

The New Orleans Railway & Light Company, through its commercial department, has been developing electric industrial trucks. Attention is called to those electric lumber tractors and stacker being used by the Otis Manufacturing Company for conveying mahogany lumber at its mill and yards, in New Orleans, where they have supplanted mule teams. They have proved economical and efficient.

Sanitary Board Would Take Over Dam—In its efforts to take over the Brandon road dam, now held by the Economy Light and Power Company, the Sanitary District, of Chicago, trustees decided to ask Governor Lowden for a special session of the legislature to urge placing the Brandon locality in the jurisdiction of the district, so that the latter, which has underbid the Economy Company, may supply light and power for the Joliet district.

Electric River Gauge.—Memphis, Tenn., has a new electric river gauge which will enable the local weather bureau to keep an accurate record of the stages of the Mississippi River at that point. The gauge, attached to a center pier of the new bridge, communicates with the office of the observer. This is the first gauge of its kind in southern waters. It obviates the uncertainties caused with the old form of gauge by local harbor eddies.

Electric Company Seeks to Restrain Industrial Commission—The Washington Water Power Company, of Spokane, Washington, has started suit in Thurston County superior court against the Industrial Insurance Commission to restrain it from collecting premiums, either for the industrial insurance or first aid, on the ground that the last legislature in enacting the law to exempt steam roads as they do an interstate business, included the electric lines that do an interstate business.

Would Sell Electric Railway.—The British Columbia Electric Railway Company has expressed a willingness to dispose of its holdings in the Province, if satisfactory terms can be secured. This was intimated to the mayor of Vancouver, B. C., by George Kidd, general manager of the electric company. The price set on the holdings on the lower mainland was set at $30,000,000. The company is willing to accept bonds to the extent of $25,000,000 bearing five per cent interest and the remaining $5,000,000 bearing no interest for five years.

Three Power Concerns Are Absorbed—The Lehigh Power Securities Corporation has been incorporated to take over the Lehigh Navigation Electric Company, the Lehigh Valley Transit Company and the Northern Central Company, all operating in eastern Pennsylvania. In the financial arrangement it is proposed to issue $20,000,000 in six per cent bonds. The plan is to tie the plants of the three original companies together, for increased economy and efficiency. It is proposed to enlarge the Lehigh Navigation plants at Hauto and Harwood, raising their combined capacity to 70,000 kilowatts. The Lehigh Valley Transit plants are being enlarged to 30,000 kilowatts. Plans contemplate the building of new plants.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Recommended Schedules for Merchandising and Lighting Campaigns.

The Committee on Co-ordinate Advertising and Sales Campaigns of the Commercial Section, National Electric Light Association, has given careful attention for a long time to the question of co-ordinating special sales efforts so as to stimulate interest on the part of the people and bring them in larger numbers to the stores where salesmen can concentrate their efforts on selling special lines appropriate to the season.

In the committee's report made for the proposed Atlantic City convention the following merchandising schedule was recommended:

MERCHANDISING SCHEDULE.

January	Clearing Sale
February	Heating Pads
March	Vacuum Cleaners
April	Sewing-Machine Motors
May	Grills
June	Irons
July	Washing Machines
August	Fans
September	Vacuum Cleaners
October	Percolators
November	Toasters
December	Electrical Christmas Gifts

For conducting special lighting campaigns the following schedule has been recommended:

LIGHTING SCHEDULE.

January	Better lighting in general
February	Outdoor lighting (tennis courts, playgrounds, etc.)
March	Stores and windows
April	Residence lighting
May	Electrical advertising (signs, outline lighting, display lighting, etc.)
June	Public building lighting
July	Industrial lighting
August	Stores and windows
September	Electrical advertising (signs, outline lighting, display lighting, etc.)
October	Residence lighting
November	Better lighting (with emphasis on office buildings)
December	Industrial lighting

The committee through its chairman, Henry Harris, of the Duquesne Light Company, Pittsburgh, Pa., is asking central stations, manufacturers and others interested in the sale of electrical appliances as to what extent they propose to adopt these schedules. It is believed that by adopting a uniform schedule throughout the country interest in these various appliances will be focused to such an extent as to materially increase their sale.

Demand for Electric Power Increasing in Ohio.

An indication of the growing demands for electric power for manufacturing purposes is evidenced by recent contracts made by the Massillon (Ohio) Electric & Gas Company, a Cities Service subsidiary. The company has just closed a 14,000-kilowatt contract with the Central Steel Company of that city. The Massillon company expects to deliver 6,000 kilowatts of this contract by August 1, and the remaining 8,000 kilowatts on January 1, 1918. Other customers, including the Massillon Rolling Mill, will require 4,000 kilowatts more in the next six months, so that the entire capacity of the Massillon plant will be taken up. Although an additional 4,500-kilowatt unit is being added to the Massillon plant, this addition will not be sufficient to take care of all the new business, so in all probability the plant of the power company will have to be enlarged so as to accommodate future generator installations.

The Central Steel Company, which has made this new contract, has been buying 1,200,000 kilowatt-hours from the Massillon company for several months past.

Motor-driven Refrigerating Machines in an Ice-cream Plant.

The accompanying illustration shows the compressor room of the Gem City Ice Cream Company, Dayton, O. This company has a 25-ton and a 35-ton Arctic compressor driven respectively by a 40-horsepower and a 50-horsepower Westinghouse slip-ring induction motor.

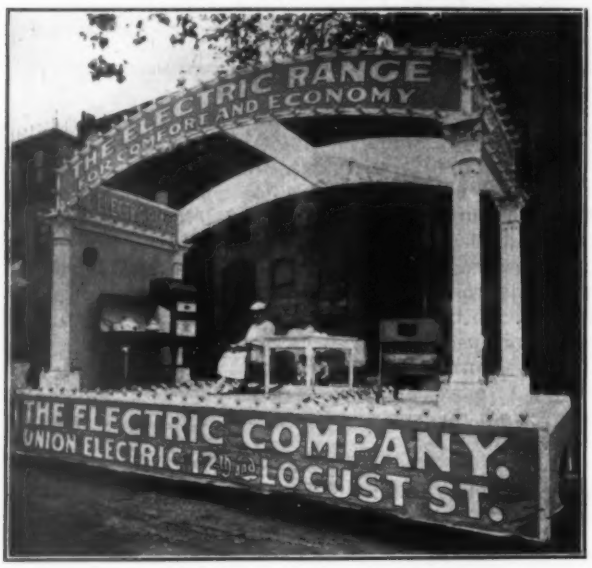
The smaller compressor is used to keep the temperature of the hardening room to about 10 degrees below zero. The larger compressor is used for ice-making and cold storage. The capacity of the plant is about 1750 gallons per day.

Economical Set of Motor-Driven Compressors in Ice-Cream Plant.

A test was made on the 35-ton machine, which showed that 32 kilowatt-hours of electrical energy were required to make one ton of ice. The total cost of energy for the two compressors is from $500 to $600 a month.

An Attractive Electric Float by Central-Station Company.

One of the most important features of the recent St. Louis Convention of Associated Advertising Clubs of the World was the splendid illuminated parade on one evening of the week's gathering. In it were nu-



Fine Electric Float Entered by St. Louis Central Station Company in Advertising Parade.

merous floats, many of which were electrically lighted. Probably the most attractive was the one illustrated herewith. It was entered by the Union Electric Light & Power Company, the big central-station company of the Mississippi Valley metropolis.

The float was carefully designed to appeal to the housewife along two lines of prime importance—cooking and washing—and showed that by the use of electricity for these usually arduous duties they would be rendered so easy and agreeable as to leave the mistress time for leisure. To bring out this effect the float was made to represent a modern and sanitary kitchen with a Hughes electric range and Western Electric washer. The young lady in charged showed by her attititude that up-to-date housework can be carried out without fuss and drudgery. Several hundred lamps made the float brilliant and attractive with light at night so that its message was instantly conveyed to all spectators.

Louisville Gas & Electric Company Leases Coal Mine and Will Operate Its Own Coal Cars.

A considerable saving in operating expenses will be made by Louisville Gas & Electric Company as the result of producing its own coal and shipping it in cars owned by the company. These arrangements will place the company in an independent situation as regards fuel for next winter when the enlarged Louisville power station will be called upon to serve the heaviest demands in its history and provides the company with ample fuel for five years.

A mine containing an excellent grade of coal, at Render, 112 miles from Louisville on the Illinois Central Railroad, has been leased from the McHenry Coal Company for five years, and a contract made with the Pullman Company for the delivery of 25 steel coal cars in September. Active mining operations have been started.

CENTRAL STATIONS AND PROFIT-SHARING.

Bonus Systems Advocated in England as Solution of Growing Labor Problem.

The British Chancellor of the Exchequer in June stated in the House of Commons what has been stated by many a student outside that the problems that will confront the legislature generally after the war would be more serious and more difficult than even the problems connected with the conduct of the war itself. It may well prove that the problem of finding employment which shall assure well-paid and contented labor will overshadow all others. It has reared its head again and again during the past three years and had it not been recognized that all forces must continue as united as possible until the defeat of the enemy was secured, difficult situations would not have been so successfully handled. Thousands of experienced minds are at work on the numerous points which form part of the whole labor problem, but we need not here and now concern ourselves with the grievances—genuine and imaginary—or with the program of the practicalists and of the idealists for bringing permanent peace into the industrial world, after it has been won between the nations.

There is, however, one matter in regard to which there appears to be growing agreement between the various schools of thought, and that is that one of the practical measures which is most calculated to bring about a more contented state of employment is payment according to results. Labor has been shy of the system in many places because sometimes when men have worked well and secured high wages, those controlling them have thought that they were doing too well and have cut them down. All the discussion of the past two years, however, goes to show that payment by results has got to be worked honorably or the suspicion which action of the above kind has engendered against employers will not be absent in the future and in consequence harmonious relations can not be secured. We are touching upon one of the matters which will probably affect millions of workers in England during the next few years, workers in the electrical and engineering trades among them, but it also arises in connection with the problem of labor in electric light and power works giving public service.

In two or three cases, managers of central stations in England receive a percentage bonus as part of their remuneration; new business salesmen depend upon results for large part of their income, and occasionally stokers reap a little benefit from the economies in fuel consumption that they are able to effect in normal working conditions. But the principle is rather the exception than the rule. We have on several occasions shown in these pages how unsatisfactory British central-station employment has been to those engaged therein in subordinate capacities, and though it is not showing itself much to the public eyes at the moment, there is a pretty considerable movement on foot in England for securing better remuneration and conditions. The movement is, we believe, strengthening itself in preparation for what its organizers will regard as the right moment. That moment may be after the war is finished, but it is being prepared for.

Therefore more than ordinary interest attaches to a paper which was brought before the meeting of the Incorporated Municipal Electrical Association in June under the title of "Individual Interest in Municipal Enterprise." The author, J. H. Bowden, is himself a

borough electrical engineer in London and he recognizes that public opinion is undergoing a radical change. He urges that those who are responsible for policy in regard to electrical undertakings should see that the best interests of such undertakings as well as those of consumers and staff can be studied by adopting profit-sharing schemes. It is a first essential, however, that the business rest upon a sound financial basis as until that is assured consumers cannot have reduction of prices and staffs cannot participate in profits.

At Poplar, Mr. Bowden's own undertaking, for a number of years prior to the introduction of a profit-sharing scheme, a drastic policy of writing down and scrapping obsolete plant was adopted, together with a system of payment out of revenue for all assets for which loans would not be raised for periods of twenty years or over. After payment of a number of specified charges on surplus profits, the available balance (if any) in any year is apportioned as follows: Forty per cent is placed at the disposal of the Finance Committee; 20 per cent of a sum up to $30,000 available for disposal, and 10 per cent on the available sum over and above $30,000, is divided among the members of the permanent staff; the remaining balance is placed to the credit of capital machinery account for writing down obsolete plant. The bonus to the staff is apportioned as follows: A moiety to the principal officers of the staff, and the other part to the junior officers and workmen permanently employed, pro rata to the normal salaries and wages paid in the year in which the bonus is earned. The proportion payable to the principal officers is divided as follows: One-half to the chief engineer and manager; one-fourth to the assistant manager; one-fourth in equal proportions to the station and mains engineers and sales manager.

Mr. Bowden says that the scheme commends itself for its financial soundness, as, no matter how rapidly an undertaking may develop, the cost of new connections and all improvements to the existing system must be taken from revenue before any sum is available for bonus. When the Poplar scheme was first under consideration the engineer advanced the suggestion that by granting some recognition to the permanent staff proportionate to the results obtained, not only would every man employed feel a direct interest in economical production, but he would also feel concerned in advocating the use of electricity at every possible opportunity. Thus a potential canvassing staff, which in many other undertakings is a direct charge upon revenue, would be created. The proportions payable to the principal officers of an undertaking, as set out in the Poplar scheme, might not appeal to every municipality or corporate utility, and as an alternative the distribution might be made wholly as a percentage of annual salary or wages. Mr. Bowden went into full details of the working of his own scheme, and into proposals for encouraging thrift among the staff by the investment of bonuses. He reiterated the assumption that although fair remuneration should command a fair return in services rendered, participation in the prosperity of an undertaking would ensure a still better return. Judicious management being the supreme factor in obtaining the best possible results, the management should participate to the greatest extent in the share of profit to the staff. Objections on the part of labor to profit-sharing schemes, he said, did not apply to electricity supply.

The fuller enjoyment of the fruits of labor by the worker was foreshadowed, and profit-sharing along some such lines as used at Poplar was put forward as a solution of a problem which would undoubtedly have to be faced by all branches of industry in the near future. If the organizations which are getting themselves into shape in England for securing improved conditions for electricity works employees can only be induced to see the matter in the light in which Mr. Bowden presented it before his fellow-chief engineers and managers at the London meeting, well and good.

Commonwealth Edison Appliance Sales Increase 100 Per Cent.

During the first three weeks of the 1917 summer appliance campaign of the Commonwealth Edison Company, Chicago, Ill., 4021 household electrical appliances were sold, this being an increase of 100 per cent over the sales for the corresponding dates last year. The campaign started on June 18. High-school students have been employed to supplement the company's regular sales force. Results are also being secured from the company's policy of paying commissions of 25 and 50 cents for sales made by employes outside the appliance department on their own time.

Boston Company Conducting Flatiron Sales Campaign.

The appliance department of the Boston Edison Company is undertaking to sell 10,000 flatirons by September 1. This campaign was launched at a dinner given to the members of the sales force on the evening of June 15.

The iron sells for $4.50 and may be secured by Edison customers on a lease basis by paying 50 cents at the time of purchase and 50 cents a month thereafter.

A replica of the General Electric factory at Pittsfield is shown on a canvas drop in the Boylston Street show window. One portion of the factory is seen in the foreground and from its entrance the flatirons come tumbling out by the hundreds, ready to be loaded onto the waiting freight cars whence they are transported to Boston.

BOSTON'S BIGGEST
ELECTRIC IRON SALE
Thousands Have Already Purchased
This is your opportunity, take advantage of it, you may never have it again
Genuine General Electric Quick Heating
Heel Stand 1917 Model Guaranteed
$5 Value at Bargain Price of $4.50
ONLY 50c DOWN
Balance Partial Payments 50c per month
To Edison Customers! Bargain Price to Others for Cash
The Genuine General Electric 6-lb. Electric Iron is one of the most economical labor-saving devices ever placed in the home, aside from the economy. Thousands of steps are saved, a cool kitchen (or do your ironing out on the porch), no nauseating odors.
The success of this Special Sale shows that our customers appreciate a bargain, and quickly take advantage of it. The thousands of sales already made testify to this.
It's not necessary for you to come into Boston to buy. All of our 15 Branch Stores are stocked for this big Special Iron Sale.
Immediate delivery. Take the iron with you or have it sent. Telephone if in a hurry.
The Edison Electric Illuminating Company of Boston
39 Boylston Street
Phone BEACH 3300 or any of our 15 BRANCH STORES

One of the Advertisements Used in Boston Campaign.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Strong Argument for Continued Building Activity.

In many sections of the country building activities have fallen off considerably since our entrance into the world war. Architects, material dealers and contractors are doing their utmost to stem this tendency. One of the best pleas for continuance of activity in this line has been prepared by H. L. Stevens & Company, of Chicago, a well-known firm of architects specializing largely in the designing and complete erection and equipment of hotels. This well-prepared argument may be of value to electrical contractors in certain quarters and is therefore given below:

DO YOU KNOW

That building costs have not kept pace with the increases in other lines and it is relatively cheaper to build today than it was five years ago?

That the price of skilled labor in the building trades has advanced very little in the past three years and, except for common labor, the labor costs on new construction have not materially increased?

That there is every indication that labor will be higher, both now and after the war, and he who builds now has the advantage of the present labor scale in the building trades?

That because automobile builders have learned more economical design and savings in construction they are able to pay more for labor and material and still turn out a car at a lower cost than was possible five years ago? In the same way the advance in the science of building has made it possible for us today to reproduce some of our finest buildings at less than they cost five or ten years ago.

That many economies in the design and construction of buildings have been discovered and these savings largely offset the increase in the cost of material?

That buildings erected now get advantage of the increase in rentals prevailing at the present time and this additional income makes up for any increase in the cost of building?

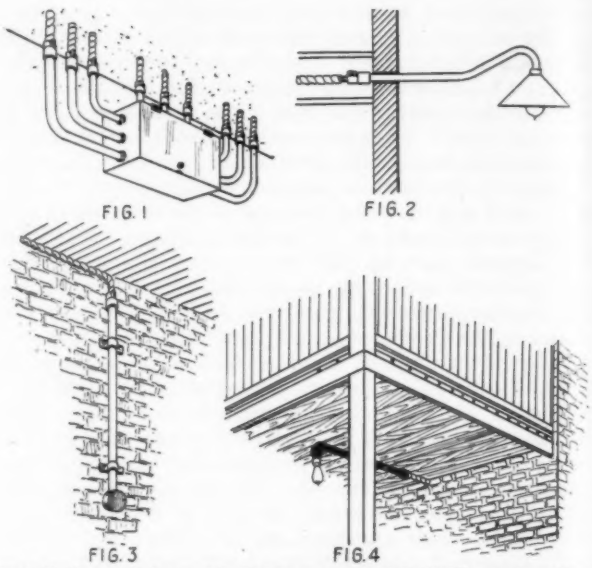
That the net profit from a new building during the next two or three years will more than offset any drop in prices that may come at the close of the war.

That the distribution of the tremendous sums that the Government is raising for the war will greatly stimulate business and good business means increased demand for office buildings, hotels and apartments? The owner who builds now will reap the profits from this business. If you need a building, *build now.*

Using Armored Cable and Conduit Without Splices.

BY A. ELTREP.

In the accompanying sketches are shown several jobs of armored-cable fishing which were completed in a neat manner without splices and with much time and material saved by using a coupling instead of a junction box where the armored cable is joined to the conduit. In all of these cases the armor is removed from the cable for a distance of three or more feet and the insulated twin wires are continued through the conduit without splices. The connection between the armored cable and conduit is made with an ordinary clamp fitting and coupling.



Installations of Armored Cable and Conduit Without Junction Boxes and Splices.

Fig. 1 shows a cutout box located in a basement directly below a plastered ceiling. This arrangement makes a neat and simple installation. Fig. 2 shows an outdoor bracket light with conduit connected to the cable just inside the wall. This same scheme can be used for connecting to the terminals of an electric sign circuit. Fig. 3 shows a wall switch or receptacle mounted on a brick wall where protection from mechanical injury is required. This can be used also if the switch or receptacle is placed on a post. Fig. 4 shows a light placed underneath a porch where an old house was wired with armored cable throughout. I believe this and similar installations of this simple method of connecting will prove of value.

General Inspection of Electric Lighting Installation in Knoxville.

A general inspection of the electric lighting facilities of Knoxville, Tenn., has been inaugurated by the city electrical inspector, E. A. Youngblood. This is a Safety-First measure and follows a series of severe electrical storms which have visited the city and disrupted numerous services. Mr. Youngblood has not a sufficient force to make a house-to-house inspection, but proposes to make as many calls as possible at residences where service has been affected.

Brush Holders and Their Care

Requirements, Classification and Construction of Brush Holders—Operating and Maintenance Features—Clearance, Angle of Operation and Noisy or Chattering Brushes

By E. H. MARTINDALE

Chairman, Industrial and Domestic Power Committee, A. I. E. E.

This is the tenth of a series of 14 articles on the solution of commutator and brush troubles. The series began in the issue of March 24 and appears at intervals of two weeks. The earlier articles of the series were devoted to brush characteristics and a general discussion of commutation troubles followed by a detailed consideration of many of the principal troubles. In the present article the importance of the type and condition of the brush holder is shown. The remaining four articles will deal with other important commutation problems and their remedies.

THE function of a brush holder is to hold the brush at a given place on the commutator or slipring and furnish a means for carrying the current from the commutator or slipring through the brush to the brush-holder stud.

A well designed brush holder will meet the following requirements:

Requirements of Brush Holders.

First.—Provide means for carrying the current from the brush to the brush-holder stud either by shunts connecting the brush to the stud or by direct contact between the brush and brush holder without undue heating or sparking between the brush and holder which would result in rapid burning and depreciation of the holders.

Second.—Provide means for accurately adjusting the pressure with which the brush bears on the commutator or ring.

Third.—Hold the brush firmly at the proper angle.

Fourth.—Permit free and quick movement of the brush to follow an uneven surface of a commutator or ring.

Fifth.—Have a tension spring of such length that the tension on a worn brush will be very little less than that on a new brush.

Sixth.—Have the brush hammer so constructed that it will bear directly on the top of the brush and not give a side push whether the brush is full length or nearly worn out. Fig. 2 shows a properly constructed hammer with the top of the brush in three different positions.

Types of Brush Holders and Their Development.

All the brush holders in commercial use today may be classed under three general types, known as box type, clamp type and reaction type. Of these, the box type was the first and the reaction type the last to be developed. The clamp type was developed in two forms, first the swivel type and later the parallel-motion type. Fig. 1* shows the four types in the order of their development; the upper sketches show the holders assembled on round studs and the lower ones bolted to rectangular studs.

In the early box-type holders it was found that when the brushes carried heavy current, arcing resulted which burned both the brushes and the holders. Longer brush holders and brushes permitting a greater contact surface reduced, but did not entirely overcome, the trouble. The remedy next tried was the use of flexible shunts, or pigtails, to carry the current from the brush to the frame of the brush holder, but the troubles encountered in attaching the shunts led to the development of other types.

The next type which came in use was the swivel type shown in Fig. 1, in which the brush was clamped in a metal box attached to an arm which swiveled about a pin. Immediately trouble developed at the swivel contacts due to arcing and burning. Shunts were then attached from the swivel arms to the studs which overcame the burning. Another development of the swivel type with shunts is shown in Fig. 3. This holder had the serious objection that the position of the brush on the commutator changed as the brush wore down and required either a very wide neutral field or frequent adjustment of the brushes.

An improved clamp type was then developed which permitted a parallel movement of the brush as it wore down. The highest development of this type, which is still in extensive use, is shown in Fig. 4.

*Electric Journal, April, 1915, page 164.

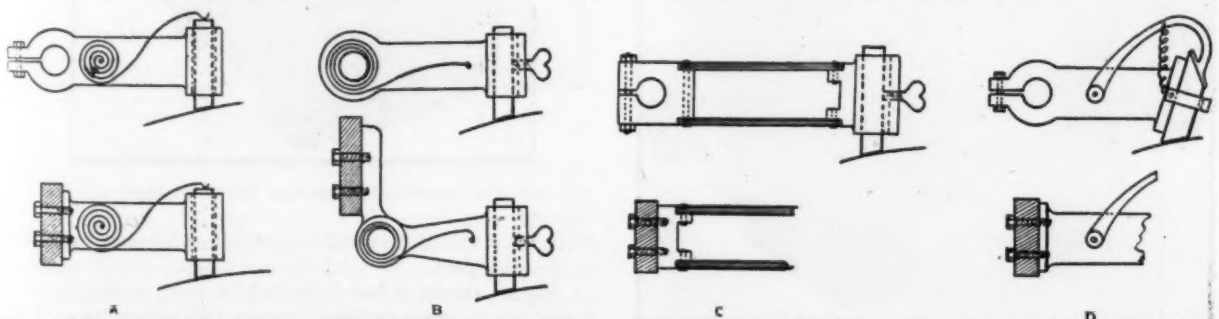


Fig. 1.—The Four General Types of Brush Holders. A—Sliding or Box Type. B—Swivel Clamp Type. C—Parallel-Motion Clamp Type. D—Reaction Type.

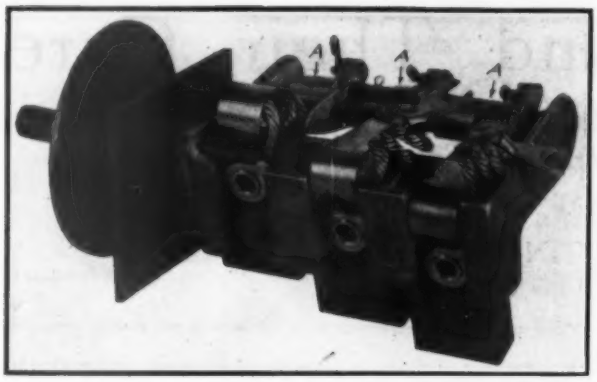


Fig. 2.—Properly Constructed Brush Hammer with Brushes in Three Positions.

The brush is clamped in the holder by the plate *C* held by the set screw *D*. The flexible copper leaves *A* serve to hold the brush holder in the proper position and also carry the current from the movable holder to the holder frame. The set screw *B* furnishes an easy means of adjusting the brush pressure. This holder has two serious objections.

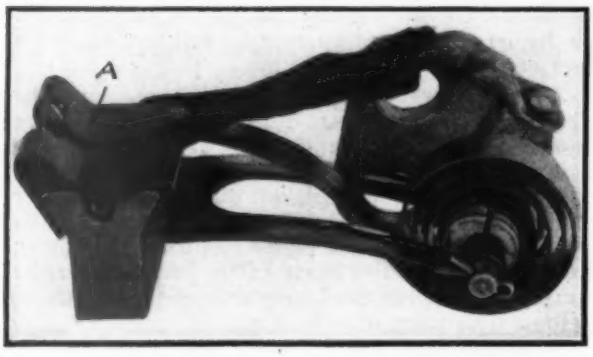


Fig. 3.—Swivel-Type Holder with Shunts.

First.—If a brush is removed for inspection, it is nearly impossible to replace it so that good contact is made between the brush and commutator.

Second.—The holder has such a high inertia that on high-speed machines the brush can not quickly follow a slightly uneven surface.

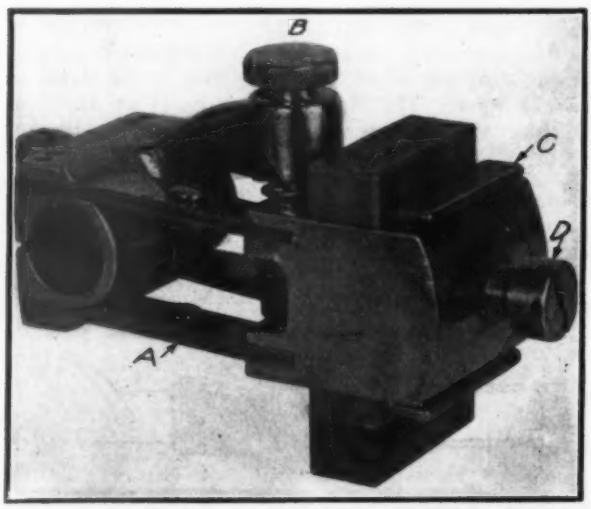


Fig. 4.—Parallel-Movement Clamp Type of Holder.

During all this time the construction of box-type holders was being improved by getting a more rigid construction of the holders, an easier and more accurate means of adjusting brush pressure, more flexible brush hammers and springs, and more accurate machining or broaching of the brush-holder boxes. Better methods of attaching shunts to the brushes were also developed. These improvements brought the box type back into general favor and it is today the most generally used type.

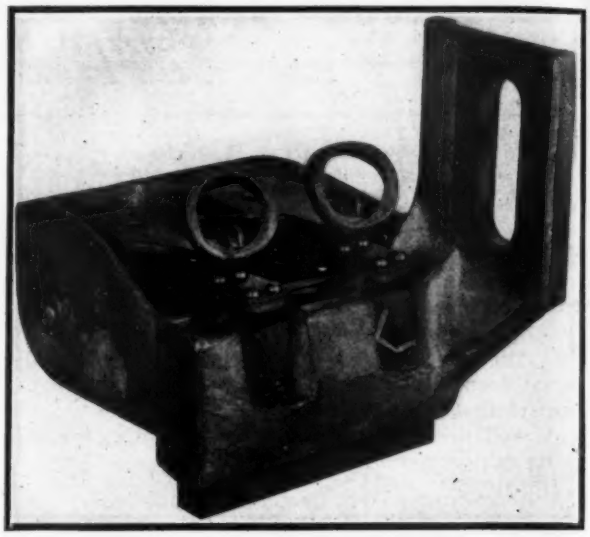


Fig. 5.—Box-Type Holder for Railway Motor.

Fig. 5 shows a box type of holder for a railway motor, Fig. 6 for a crane motor and Fig. 7 for a stationary motor, in each case without shunts attached to the brushes.

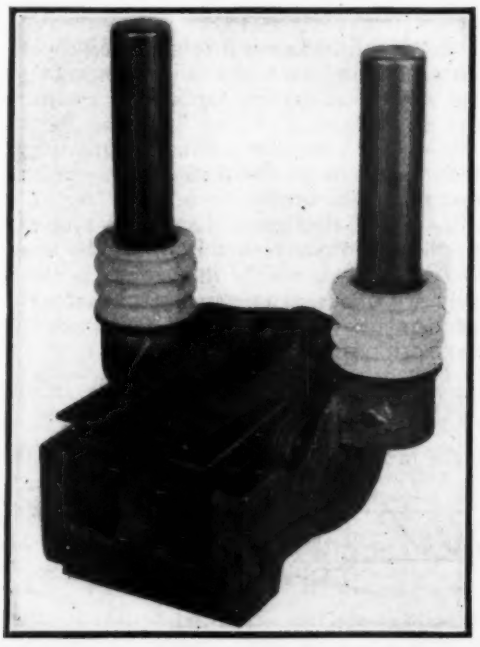


Fig. 6.—Box-Type Holder for Crane Motor.

Fig. 8 shows a box-type holder with shunt in frequent use on medium-size motors and generators. The construction of holders similar to Fig. 7 and 8 makes

it easy to remove the brushes for inspection while the machine is in operation.

Fig. 9 shows an improved box type equipped with a double brush-holder hammer. The inner portion is

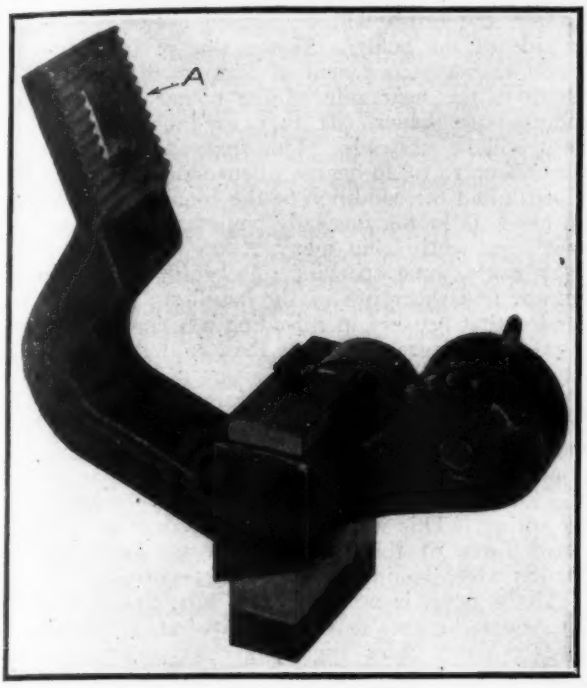


Fig. 7.—Box-Type Holder for Stationary Motor.

made from very flexible spring brass or bronze, which enables the hammer very rapidly to follow a movement of the brush and makes this type particularly adaptable to high speeds.

Fig. 10 shows brush shunts equipped with glass or lava-bead insulation to prevent contact between the shunts and the motor frame.

Fig. 11 shows shunts equipped with cotton-sleeve insulation and the brush hammer equipped with a

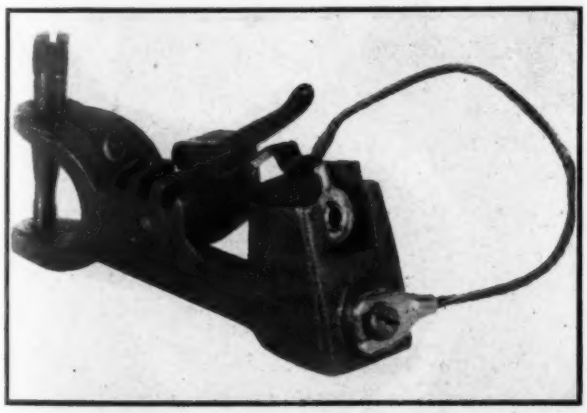


Fig. 8.—Box-Type Holder with Shunt for Medium-Size Machines.

lava-bead tip to prevent current from passing through the brush hammer and spring which might take the temper from the spring. With well constructed brush shunts this precaution is unnecessary.

The latest type brush holder to be developed is the "reaction type," so called because the brush is held in place by the resultant of the pressure of the hammer on the brush and of the brush on the commutator. Fig. 12 shows this type. The guard is a "safety first" device to prevent the brush from accidentally slipping out, or working out sideways from under the hammer and to enable the operator to lift the brush hammer without danger of the brush falling onto the commutator.

Fig. 9.—Box-Type Holder with Double Brush Hammer.

Fig. 10.—Brush Shunts Covered with Lava-Bead Insulation.

Fig. 13 shows a reaction-type brush on a commutator. The hammer *A* is so constructed that it gives a straight thrust and bears very nearly on the center of the top of the brush from the full length of a new

Fig. 11.—Insulated Brush Shunts and Brush Hammer.

brush to the short length of a worn-out brush. The long spring *B* maintains a very uniform pressure in all positions of the brush. The arrow shows the proper direction of rotation with reaction-type brushes.

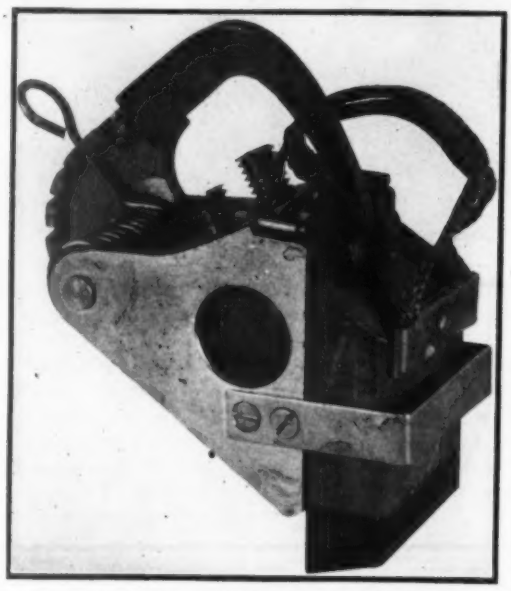


Fig. 12.—Reaction-Type Holder with Safety First Device.

Operating Features and Maintenance of Brush Holders.

In the operation of reaction-type brushes it is essential that the bevel on the commutator end be large enough so that the sine of its angle is greater than the coefficient of friction of the brush.

In box-type holders a minimum clearance between brushes and holders of from 0.002 to 0.003 inch is required to permit free movement of the brushes. A clearance of 0.012 inch will usually be satisfactory. If the machine operates in one direction only and the brushes are equipped with shunts, a still greater clearance can be allowed. On motors which operate in both directions it will be found economical to renew the brush holders when they have become worn or burned so that the clearance is greater than 0.012 inch.

The brush holders should be occasionally cleaned out with a rag moistened in gasoline, particularly where lubricant is used in the brushes or on the commutator or where oil cannot be prevented from creeping onto the commutator from the bearings.

The effect of the angle of operation with box-type holders is very important, and as far as the author knows no systematic study of this problem has been made. At least two laboratories are now preparing to cover this subject carefully.

Many cases of excessive heating, chattering, vibration and breaking of brushes are caused by operation at the wrong angle.

When a commutator is running toward the sharp toe of the bevel the brushes are said to be operating in a "leading" position. When the commutator runs toward the blunt heel of the bevel the brush is said to be operating in a "trailing" position. These positions are illustrated by Fig. 14. The use of these terms in this connection has no relation to whether the brushes are ahead of or behind the neutral or commutating plane.

Let us discuss first the "leading" position in which the friction of the commutator on the brush opposes the direction of the force due to the pressure of the brush. If the sine of the angle of bevel is less than the coefficient of friction between the brush and commutator, the brush will be carried over against the far side of the holder. If the sine of the angle is greater than the coefficient of friction, the brush will adhere to the near side of the holder similar to a reaction-type holder. If they are about equal the brush will be unsteady. This unsteady angle varies from about 10 to 20 degrees, depending on the grade of brush and the condition of the commutator. When the brush is in the unsteady zone it will chatter, be noisy, frequently chip away at the edges and generally cause some sparking, blackening of the commutator and short life of the brushes. It is recommended that brushes in a leading position be beveled less than 10 degrees or more than 20 degrees, preferably the latter.

In a "trailing" position, the forces are in the same direction. The force of the friction may be analyzed into two forces, one against the brush holder and the other along the brush against the commutator which is in addition to the pressure applied to the brush by the spring. This is a cumulative action in that the added force of this friction pressure increases the friction which again increases the pressure and so on.

If the bevel is 20 degrees or less, this soon runs out. Some brushes may be operated at 30 degrees or in exceptional cases slightly greater angles without trouble. With many brushes trouble will develop at 25 degrees or in some cases even at 20 degrees. With the large angles the brush has a "clutch" action and if the bevel is large enough the brushes will wedge and break. At bevels of 25 or 30 degrees in a trailing position the cumulative action between the frictional pull and the pressure may cause excessive heating due to friction loss. It is recommended than in a trailing position brushes be operated at not more than 18-degree bevel.

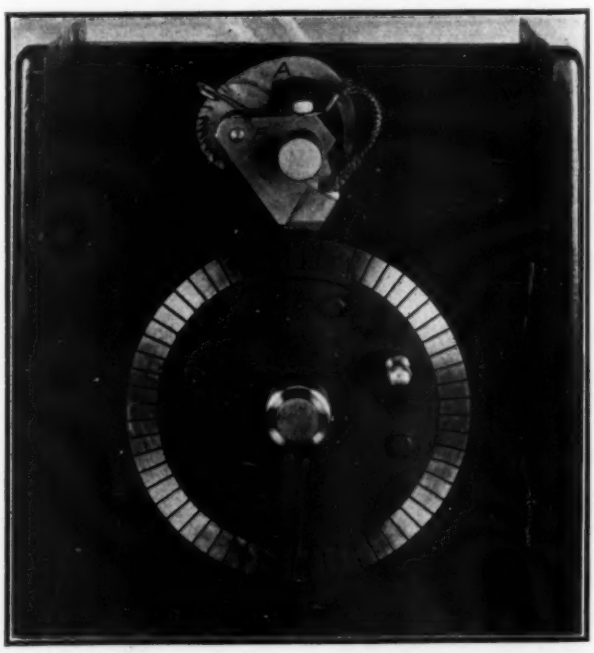


Fig. 13.—Reaction-Type Brush Applied to Commutator.

For reversing machines the radial position with a

good fit between the brush and the brush holder is recommended.

Cause and Cure of Noisy Brushes.

There are several causes for the noisy operation of brushes. The wrong angle of operation in a "leading" position described above produces noise due to chattering or pounding action of the brushes. Temporary relief can be obtained by occasional lubrication, but for permanent relief it is necessary to change the angle of operation or the direction of rotation. A change of grade will in some cases overcome the trouble.

Noise from chattering may result from high-friction brushes and can also be temporarily relieved by lubrication. It can frequently be overcome by a change in spring tension, but will often require a change of grade to secure permanent relief. All abrasive brushes have high friction and if the machine requires abrasive brushes to prevent the mica from becoming high and the abrasive brushes are noisy no time should be lost in undercutting the mica and installing low-friction non-abrasive brushes.

Chattering means a high power loss and overheating of the commutator, just as pounding a piece of iron will make it hot.

Fig. 14.—Leading and Trailing Brush Positions.

Noise may be caused by high mica, in which case the pitch of the sound will correspond to the number of bars passing under the brush per second. High mica can be kept down by the use of abrasive brushes, but it is more economical to use a commutator stone or to undercut the mica.

A quite different noise is caused by high bars. This will produce a decided knock, once each revolution for each high bar. The high bar will generally have a higher polish than the average, while the bars just behind this one will generally be duller than the average. If high bars are present, the commutator bolts should be tightened just after the machine is stopped while the commutator is still hot and the commutator should then be turned or ground with a commutator stone.

In exceptional cases, noise may be caused by wide slots with thin brushes. This can best be overcome by filling the slots with commutator cement.

An Enterprising Electrical Contractor.

Headquarters of the Childers Electric Company, at 333 West Main Street, Louisville, Ky., are almost exactly opposite the rear steps of all west-bound street cars on four lines which pass the corner of Fourth and Main Streets. This is one of the biggest transfer points in town and there are always people waiting. The company therefore has placed a red lawn bench in its entranceway and over it is a sign: "Sit down and wait for your car." On hot days waiting passengers are much delighted to discover that an oscillating fan is turned on the bench and while they wait they cool. During the winter months there is also a sign on the doorway inviting people to step inside and keep warm while waiting for their cars. These courtesies have developed the good will of the company and brought it considerable business.

C. C. Childers, head of the Childers Electric Company, recently described a neat plan by which objections of manufacturers to changing from steam to electric drive are met. The objection relates to the freight elevators in use, which are usually operated by a belt attached to a countershaft. "What will we do about the elevator?" is a question that interrupts many a plan. The Childers way is to mount an electric motor, up to about 10 horsepower, belting it to the elevator gearing and making no other alterations. The ropes or levers which previously served to throw the elevator belts on or off are connected to the lever controlling the motor and the elevator service continues just the same. This obviates the necessity of maintaining a reserve power for the elevator and the average cost of installation does not exceed $50.

Among the Contractors.

L. F. & F. J. Hatch of Scobey, Mont., have succeeded the Scobey Electric Company.

The Paradise Company, electrical contractor and dealer in Louisville, Ky., has changed its name to the Acme Lighting Fixture Company.

The B-R Electric Company, Kansas City, Mo., has secured the contract for a municipal light plant at Ashland, Kans., provided for by a recent $16,700 bond election. A 100-kilowatt engine-type generator connected to a De La Vergne oil engine will be installed.

L. K. Comstock & Company, 30 Church Street, New York, have received a contract for electrical work in the new Public Library to be erected by the city of Philadelphia, Pa., on the Parkway; the installation will cost $44,700. The structure will cost $2,535,000. The former contract awarded for electrical construction in the building was rescinded.

Electrical contractors of Louisville, Ky., have taken a joint contract to install the electric lighting systems in the numerous buildings of the Federal Army cantonment, being constructed just south of the city. There are to be about 1800 buildings of every character, and wiring of them will require about 17,000 drop lights. Construction will be of the open type, with nothing fancy about it. It is estimated that the job will yield about $64,000, being an average profit of $1000 for each contractor. The contract was let to the Bland Electric Company and the Childers Electric Company, "representing the Electrical Contractors' Association of Louisville." It has been taken by the contractors in a group, with the idea that by this means the various concerns will be able to preserve their organizations.

The Dealer and Storekeeper

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

Special Washing-Machine Campaign Proves Successful.

To develop a considerable demand for electric washers in a city where there has not been much special promotion work for these valuable household utilities is a difficult undertaking, especially in an industrial city with a large foreign element. That it

Window Display During Special Washing-Machine Campaign.

can be done by an enterprising electrical dealer is shown by the experience of the Wilson & Painter Electric Company, Walnut and Second Streets, N. E., Canton, Ohio.

A few weeks ago this company undertook a week's campaign on the Eden electric washer. This is a high-class all-metal cylinder machine that is able to wash the most delicate fabrics as safely and thoroughly as the heaviest goods. To demonstrate this fact it was conceived that the washing of paper money would show this conclusively. Arrangements were made with the Central Power Company, the Canton central station, to utilize one of its street windows and a part of its general display room at the Cleveland Avenue office, which are generously placed at the disposal of local contractors and dealers. The accompanying illustration shows the window display that was made.

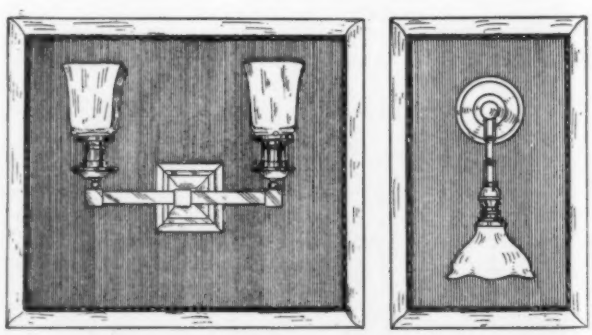
Some advertising was done in the local papers advising persons that they may have old paper money washed perfectly clean according to approved government methods. Circular letters were also sent out to a few selected customers of the lighting company. Quite a few people came in to see the machine and its demonstration. To these the merits of the washer were explained, also the easy installment method of payment that was especially offered during the week's campaign. A discount was offered for each. The washers were placed in homes on trial. The net result was that 19 washers were sold through these efforts. This was regarded as very good because the city had not heretofore been worked intensively according to modern methods of merchandising and this kind of campaign was therefore rather new to the community.

Showing Wall Brackets Effectively.

In most stores dealing with electric fixtures it is still the custom to mount these in promiscuous fashion both on the walls and ceiling of the display room. The result is that this room usually resembles the interior of a cavern with a mass of stalactites hanging from the ceiling which only confuse the prospective purchaser and make an intelligent selection of fixtures well nigh impossible. The same is true of wall brackets which when mounted very closely all over a wall make it very difficult to focus attention upon any particular pattern.

To enable a prospect to center attention upon a particular design some dealers have hit upon the plan of mounting at least some of the designs on panels instead of directly on the wall. Such a panel is most effective if it has a black background made of satin or other inexpensive goods; this makes the fixture stand out and isolates it from other designs that may be adjoining. The accompanying illustration shows two of these panels which can be made up quite inexpensively, it being necessary to use merely some simple picture molding around the edge. These panels may be so arranged with screw eyes at the top and bottom that they can be inverted.

The necessity for utilizing wall space most effectively and yet at the same time of showing the fixtures to advantage, requires some method of this sort to



Panels With Black Background for Wall Bracket Display.

enable the purchaser to concentrate his attention upon a design that seems to strike his fancy instead of letting his eye wander back and forth in bewilderment over an extensive array of fixtures which not only retards selection of the final designs but may make it entirely impossible, and thereby prevent a sale.

Adopting Slide Publicity to Increase Electrical Business

The Photoplay and Its Effectiveness in Advertising—Keen Hints and Sidelights on This Method of Impressing Customers—Every Phase of Subject Discussed in Interest of Electrical Trade

By ERNEST A. DENCH

Author of "Advertising by Motion Pictures."

WHY do they give us books instead of pictures, was the remark I overheard after a photoplay overburdened with explanatory matter had been run off on the screen. This adequately expresses the opinion of ninety-nine out of every hundred "movie" patrons.

The same is true of slide advertising, which, in order to prove effective, must be in complete harmony with the surroundings. Your announcement should live up to the "every picture tells a story" slogan. The greatest obstacle in the way of the widespread adoption of illustrations in newspaper, street-car and bilboard advertising is the expense. Artists, cuts and color printing are costly for local purposes, and it is only national advertisers who find same a very profitable investment. They are able to use them in large quantities, consequently greatly reducing the cost of production. It is for this reason that so many electrical dealers have to remain satisfied with plain announcements, which undoubtely serve their purpose.

Use of Pictures in Colors.

But there is absolutely no excuse for the electrical dealer employing such copy on the motion-picture screen, for it costs as much for a slide without a picture as it does with one. And what is more, you can indulge in the luxury of colors, since no slide manufacturer worth his salt turns out designs in black and white.

There are other compensating advantages, too. Children are keen movie fans, and if the eye is appealed to they can grasp the purport of your message. The picture accomplishes this as easily as "kiss your hand," and as most children delight in telling those at home what they have seen, your announcement will be brought to their notice in an indirect way.

All Can Read Picture Impressions.

Have you considered the foreign element as well? With their smattering of English, it is a mooted point whether they can comprehend a plain announcement slide. The picture, however, knows no language, so you have them immediately interested. The photoplay author, in calling upon explanatory matter to help along difficult stages of his story, has to bear in mind that each word means one foot of film. What you should realize is that in the limited time your slide occupies the screen it has got to sink in, and the clever picture with a few appropriate words thrown in for good measure will get across, while your neighbor is extravagantly using up the English language.

The slide companies put out stock designs. A typical slide put out recently showed a hysterical man jumping as the results of electric shocks. At the side was this message: "It's Electrical Work That We Want to Do for You. Call Us Up." All you have to do is to write in your name and address at the bottom of each slide. Stock slides cost from 35 cents to $1 a piece.

Stock Slides for Electrical Trade.

The slide manufacturer, when preparing a stock slide for the electrical trade, has to make it apply equally well to electrical dealers throughout the country. Occasionally, however, he slips a cog, but this is not altogether his fault; you are alone to blame for purchasing a slide which misrepresents your business. It may, on the other hand, just fit in with the individual needs of your competitor a few blocks up the street.

Photoplays Should Represent Facts and Yet Be Original.

Photoplay audiences should not be disillusioned; the screen must be kept free from abuses, for once spectators discover that you are in the habit of misrepresenting the facts, they will evince less interest in your announcements. Therefore, when purchasing a stock slide let the deciding factor be: "Does it apply truthfully to my own store?"

You can use the stock slide and still give photoplay-goers the impression that you are decidedly distinctive. The motion-picture exhibitor believes in hiring his screen to one advertiser in each trade; consequently, if the slide has been prepared especially to boost your store there is no fear of overlapping.

The only way a person could discover that your stock slide is used by a competitor would be if he were a patron of more than one motion-picture theater. Here, again, you would secure a brilliant victory. The fan, not being in the know, and having seen your announcement first, would proclaim you as the originator. So if you notice a fellow trader using a stock slide which takes your fancy, do not go and do likewise. Select something different. It is hard to maintain the interest with single stock slides, but with a good series or serial you can actually make folks look forward to the next slide.

Get Exclusive Rights.

It is essential to secure the exclusive rights for your town, which is now possible, since the slide manufacturers have produced a number of excellent series. This concession, which may be obtained by paying an additional fee, is important because the slides can be filled in to suit almost every business.

In a series of slides you can put over an entertaining story, humorous in parts and educational in that you point out why folks should trade with you. A clever scenario writer-artist and skilled slide manufacturer can do wonders for you in this connection.

The Personal Touch Essential.

While the stock slide covers wide area, it cannot be extended to establish the personal touch between the electrical dealer and prospective customer. Its versatility ends just where it is essential to present the intimate appeal which accounts for so much. What is that elusive something, the personal touch? To my mind, it is by introducing yourself to your prospects. Where is your store located? True enough, you will not neglect to include your name and address on the stock slide, but first impressions are lasting. It is my intention to advocate the adoption of what I may term the photo-slide for want of a better name.

On your visits to the local photoplay theater you will have noticed that the exhibitor is prone to using announcement slides of forthcoming productions. On this kind of slide an important scene is reproduced from the picture and tinted in natural colors, while the blank space is used to good advantage with a brief description of the film.

If you wish to plan an advertising campaign along similar lines, it is up to you to have some photo-slide specially designed to conform with your individual requirements. The best way by which to present the personal appeal is by having a photograph taken of the exterior of your electrical store. You can then forward same to a reputable slide manufacturer, who will make a slide out of it in natural colors and add the desired description.

The slide should have two marked effects upon spectators. Firstly, visualize for them exactly where your establishment is situated so they may recognize it on sight and, secondly, leave a favorable impression.

Having Your Slides Shown.

In selecting the most suitable motion-picture theater for your slide announcements, several points have to be taken into consideration. Suppose you are situated in a residential section. In most towns, at least, the downtown photoplay shows attract folks from all sections; so, should you decide upon a downtown theater for your announcements, you are paying for scattered circulation. Not only that, but the exhibitor rates the advertising value of his theater at a much higher figure. Few towns possess local newspapers which circulate exclusively in one section, and as you draw the bulk of your business from surrounding blocks, it is advisable to pick out a photoplay theater within a few hundred yards from your store. This should be comparatively easy because such conditions exist in most towns.

Motion-picture theaters may be divided into two general types. One is the nickeldrome, which has been converted from an empty store and seldom accommodates more than five hundred. It usually shows the oldest films and caters to a cheap patronage. "Circus" advertising proclaims this fact in nine cases out of ten.

Although the motion-picture theater is a democratic institution, the well-to-do working classes prefer to patronize the classy building which has been specially erected for motion pictures. It is not because they refuse to associate with their poorer brothers and sisters; quality is the deciding factor. For five or ten cents more they see a longer and better program amid more comfortable surroundings. This modern kind of show usually accommodates at least one thousand.

Developing Managerial Policy.

So far so good—the rest depends on the managerial policy. The best way to discover this is by visiting a desirable theater as an ordinary patron, and if your trade is already represented on the screen, the theater is available for the time being. This may strike you as peculiar, since no newspaper grants a monopoly, but it is the custom in slide advertising.

The healthiness of a newspaper may be judged by the volume of advertising it carries, but it is the reverse in the case of the motion-picture theater. The fewer the slides shown the better, as time is precious, and if the exhibitor is to give each advertiser the service he pays for, he can only do so when his slides do not exceed one dozen. When the number is in excess of this the operator usually whips each one off before spectators are able to read same.

Contracts With Exhibitor.

When you have satisfied yourself on all these matters, you can interview the exhibitor, who will probably suggest a six months' contract. You may be averse to this, but your signature would be justified in view of the fact that the rental, which will vary from $5 to $10 per month, according to size and location of theater, will work out more cheaply than on the weekly basis. It will also afford you protection, for your competitor will not have an opportunity to put one over.

One insertion of an advertisement seldom produces results, and the same is true of slide advertising. You have simply got to hammer the facts home to the public, for the constant seeing of your name will go right home. Another thing, do not neglect to change your slide frequently. If you are running a series or serial, however, you must remember that most theaters change their programs daily, and only a proportion of patrons attend regularly. Some days the program does not appeal to them, so they favor the rival show, and you could not therefore expect to have many follow same from beginning to end unless you took the system in charge.

Every now and then a photoplay producer releases a series or serial. It is booked by the exhibitor, who arranges for it to be shown at his theater in weekly installments. Those of his patrons—and they constitute the majority—take good care to be present each week on the evening set aside for the installment. So if your slide series or serial started off with the photoplay it would be seen in its entirety by most folks.

UNITED STATES STEEL ENTERS SHIPBUILDING INDUSTRY.

Federal Shipbuilding Company Will Construct Large Plant on Hackensack Meadows—$6,000,000 Appropriated.

The Federal Shipbuilding Company, the new United States Steel Corporation subsidiary, is to begin work immediately on the construction of an electrically operated shipbuilding plant on Hackensack Meadows, N. J., for which the corporation has appropriated $6,000,000. The plant will be large enough to accommodate twelve ships of varying sizes up to 10,000 or 12,000 tons at the same time. It is expected to have the plant ready for operation early in January.

While no ship contracts have yet been made, there is no question that the plant, from the time it is ready for operation, will have all the business it can handle. In fact, the corporation's own requirements for ocean tonnage, exclusive of government or outside needs, would insure full operations for some time.

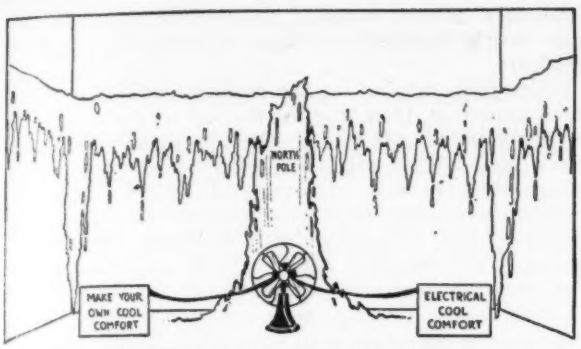


Fig. 1.—Suggestion for a Display of Electric Fans.

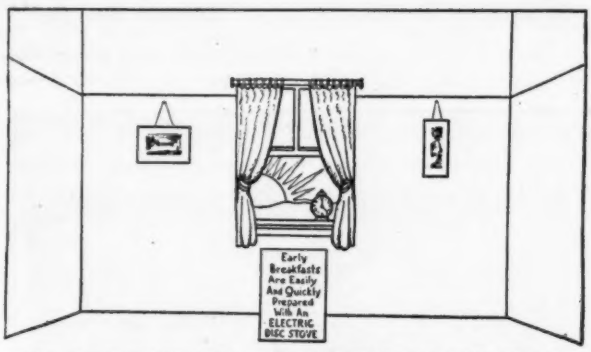


Fig. 2.—Suggestion for a Display Featuring Disk Stoves.

TIMELY SUGGESTIONS FOR WINDOW DISPLAYS.

Summer Season Offers Excellent Opportunities to Display Seasonable Appliances to Advantage.

Much has been written regarding the importance of the show window to an electrical dealer. The value of the window space is, however, proportional to the degree of attention which is given not only to an attractive dress but to the timeliness of the goods displayed.

The summer season offers exceptional opportunities to the electrical dealer to arrange special displays of appliances which are of particular appeal during hot weather and the accompanying suggestions, which will be presented by the Society for Electrical Development in its July "sales service" will be found particularly pertinent.

The suggestion shown in Fig. 1 is for use with a display of electric fans.

"Icicles" extend entirely around the background. To make these, use either cotton wadding or cotton batting. The icicles can be cut the desired shape with scissors if wadding is used. The batting icicles should be cut or torn and rolled in the hand to give a better shape. Diamond dust or powdered mica, bought from a painter, should be sprinkled on the icicles. A cut-out North Pole is the center piece. The cards are connected with ribbon to a fan and read, "Make your own cool comfort," "Electrical cool comfort."

Fig. 2 has a window against the background. The frame can be made by nailing a few strips of wood together.

Curtains are hung at the sides. Through the window is a sun just rising above the horizon. This should be a scenic panel set back a short distance from the window frame. An alarm clock with the hands at five o'clock stands on the window sill. Small pictures are hung at the sides.

Electric stoves should be featured. The card is inscribed, "Early breakfasts are easily and quickly prepared with an electric disk stove."

Fig. 3 is a suggestion for a wiring window based on the idea of having a house wired while the family is away, on vacation or recreation.

Against the background a narrow shelf is fastened. On this is placed a toy locomotive and coaches.

Tennis racquets, golf sticks and fishing rods, borrowed from a sporting goods house, are hung at the ends of the shelf. Along the edge of the latter time tables are hung.

Cards say, "While you're away on that vacation trip—let us wire your home for electric service."

This is a strong appeal for business.

The window shown in Fig. 4 should be used as a feature of the industrial lighting campaigns that will be held during July.

Panel cards across the background show silhouettes of factories. These might be made as transparencies lighted from behind.

On one side of a dividing line, a bare lamp is hung with cards reading, "Poorly Lighted," "Low Production," "Errors and Accidents," "Spoiled Goods."

On the other side should be a fixture of the kind that is best adapted to the needs of the prospects. Cards read, "Well Lighted," "High Production," "Safety," "Cheerful Employees," "Small Percentage of Spoilage."

Electric Ranges Popular in Montana.—Manager McDonald of the Kalispell (Mont.) Division of the Northern Idaho & Montana Power Company, says: "We have just sold our 125th electric range in the eight months' campaign and there is not one of the 125 ranges which is not being actively used."

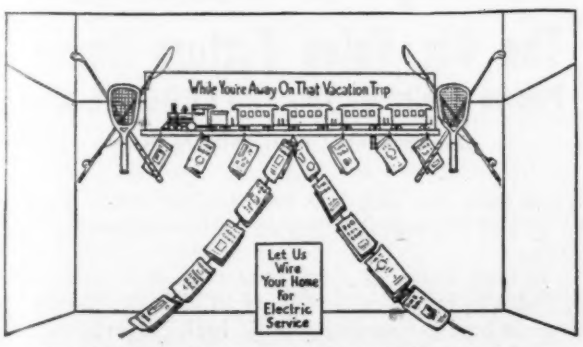


Fig. 3.—Suggestion for a Wiring Window Display.

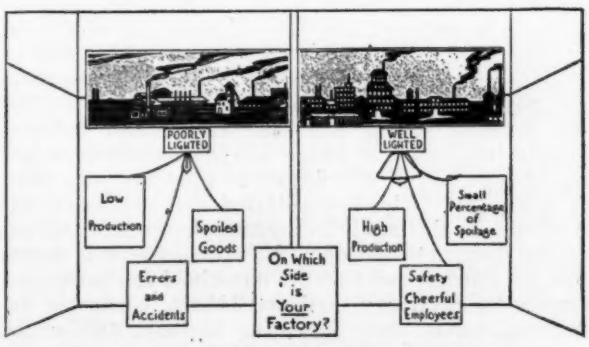


Fig. 4.—An Industrial-Lighting Window Display.

Successful Merchandising of Electric Ranges.

There is nothing particularly significant about the store front shown in the accompanying illustration,

Store Front That Influenced Many Electric Range Sales.

and yet it has been an important factor in the sale of several hundred electric ranges in the city of Billings, Mont. By aggressive merchandising methods, the Montana Power Company has made a record for range sales, many of which were consummated in the company's sales room and were influenced by demonstrations in the show windows.

Two significant facts which electrical dealers should take to heart are, first, that in spite of the higher rentals, stores located in the center of the retail shopping district are in the end much more profitable than more obscure locations; and, secondly, window space should be utilized with the same degree of intelligence as characterizes the interior arrangement of the store.

WESTERN ELECTRIC COMPANY'S ARRAY OF SALES HELPS FOR THE DEALER.

A Noteworthy Collection of Educational Publicity Material for Electrically Operated Household Devices.

The Western Electric Company, 195 Broadway, New York City, with branches in all principal cities of the country, has issued a 28-page large-size book, devoted to its sales helps for dealers of electrical labor-saving and time-saving household appliances. It is virtually a manual of household utilities, presented with illustrations that contain a keen touch of the realistic.

This is all typical of the very liberal Western Electric educational publicity policy intended to exert an influence in making more users of electricity in domestic life. It is to bring about the general acceptance of the idea expressed in the slogan, "Do It Electrically." The many illustrations, showing such things as the new portable sewing machine, washer and wringer, electric iron, cooking range and dish-washer, should appeal especially to the dealer, as they represent lines of appliances fully demonstrated and nationally advertised. In this really interesting presentation of advanced thought on the domestic side of life, it is shown how the hardest tasks of the household are being performed by electricity; and that electric current is decreasing, rather than increasing in cost; that it dispenses with much of the domestic help and makes the housewife able to manage and handle much of her own work without having to resort to old-time drudgery.

Electricity applied to the sewing machine receives much attention, including the display of numerous advertising plates adapted to the use of the dealer in doing local advertising. In fact, an effective publicity campaign is outlined for the use of dealers. This suggests lantern slides, window displays, cards and illustrated folders. The electrically operated washers and wringers are shown in several types, with suggestions for advertising and giving convincing demonstrations of their utility. Then there are shown ways of bringing the mountain breeze to your home by the use of a Western Electric oscillating fan.

The cooking range and water heater, their utility and efficiency, are presented in a way to show the dealer how he may make the Western Electric Company's generous scheme of advertising serve his own interests.

This is a publicity book that should prove of special interest to thousands of dealers in the domestic electrical appliance line.

Low-Priced Fixtures Featured in Campaign by Boston Dealer.

The firm of Farley & MacNeill, of Boston, Mass., believe in the value of special campaigns especially during the so-called dull seasons. At the present time a special fixture sale is being conducted, two low-priced units being featured. As shown in the accompanying reproduction of a recent newspaper ad-

ELECTRIC FIXTURE SALE
$3.95
Mail Orders Filled
$2.95
Please note the above fixtures as examples of our values, wired complete. Hundreds of others to select from.
Write for sheet showing other designs.
Farley & MacNeill
The Big Value Fixture House
Phone Main 6205 98 FEDERAL ST.

Advertisement of Boston Fixture Dealer.

vertisement one unit is a semi-indirect bowl listed at $3.95 and the other a shower fixture selling for only $2.95.

In both instances sharp reductions have been made in order to influence customers to visit the company's store, where a complete line of high-grade fixtures is carried in stock.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 393.—MAINTENANCE OF UNDERGROUND LINES.—What has been the actual cost of the maintenance of underground cables, conduits, etc., for series street lighting at various voltages and different systems, exclusive of electrolier maintenance? What does this maintenance consist of?—T. S. P., San Francisco, Cal.

No. 395.—SHALLOW CONCEALED-PLUG FLUSH RECEPTACLES.—The owner of a house that I am wiring desires to have installed in the shelf of a mantle some flush receptacles so that the plug does not project above the surface. The shelf is only two inches thick and I am, therefore, at a loss to know just how to install this and have it concealed. The owner insists that he has seen many mantles with flush plugs in the shelves. The only solution I can think of would be to use a very shallow receptacle, but I do not know of any on the market that is shallow and at the same time conceals the plug. Is it possible to secure any receptacles of this sort? What is the accepted practice in a case of this kind?—F. J. E., Westburg, N. Y.

No. 396.—STORAGE-BATTERY ELECTROLYTE.—I have heard conflicting statements regarding what specific gravity it is best to have for the acid electrolyte of lead storage batteries. Some persons advise a weak acid and others a strong acid. What is the best strength to use? What is the effect of having it too strong or too weak?—R. H. T., St. Louis, Mo.

No. 397.—GLARE-FREE AUTOMOBILE HEADLIGHTS.—Has any uniformity of opinion been reached as to the best way to make headlights of automobiles free from glare?—M. S. D., Columbus, Ohio.

Answers.

No. 392.—DEPRECIATION CHARGE AND COST OF REINSTALLATION.—When setting aside an annual depreciation charge for replacing wornout, obsolete or other unsatisfactory utility equipment, is it customary to provide in this charge for the cost of installing the new apparatus or other equipment, or merely for the cost of purchasing new apparatus for that thrown out? In the latter case, to what account should be charged the cost of setting and connecting the apparatus in place?—B. E. H., Maywood, Ill.

The practice of a six-million-dollar corporation is to charge the reinstallation cost to the purchase price of the replacing equipment; depreciation is figured on the whole. The cost of an ordinary repair, such as would be in the nature of maintenance and due to ordinary wear and tear, is chargeable to the operating expense account. An extraordinary repair, renewal, change or improvement that enhances the value or appreciably increases the life of an equipment, is charged against the depreciation reserve, that is, the amount is subtracted from it and by so doing the expenses are distributed over the life of the same.

The value of an equipment is determined by the appraiser, the length of life assumed by the engineer and the auditor decides to which accounts the expenses are to be charged. This involves careful interpretation; in some instances the magnitude of the charge is the deciding factor as to which account is considered.—M. K., Rochelle Park, N. J.

No. 394.—TRANSFORMER DESIGN.—I would like to know the size and amount of wire for a transformer with 110-volt primary and 6-volt, 10-ampere secondary, to be used on a 60-cycle circuit. The core I would like to be of rectangular shape and square cross section, made from sheet-iron stampings. The transformer is to be used with a number of low-voltage lamps.—R. W. M., Mabel, Minn.

The frequency is 60 cycles per second, primary voltage 110 volts, secondary voltage 6 volts, and secondary current 10 amperes.

Let f = frequency,
N = number of turns on the primary,
Φ = total flux linked with the armature turns,
E = voltage of supply,

then $N\Phi = E \times 10^8/(\sqrt{2} \times \pi \times f)$
$= 110 \times 10^8/(1.415 \times 3.1416 \times 60)$
$= 41{,}100{,}000.$

This is the product of the total flux and the number of turns. The number of turns N may be varied within wide limits, but change in N changes the value of the exciting current in the primary at no load. Increasing the number of turns decreases the exciting current and vice versa. Increasing the number of turns decreases the total flux Φ and vice versa.

Let $N = 220$ turns,
then $\Phi = 41{,}100{,}000/220$
$= 187{,}000$ lines of force nearly.

For the transformer to operate satisfactorily on 60-cycle current the magnetic circuit should contain not more than 12,000 lines per square inch, thus the cross-section of core required $= 187{,}000/12{,}000 = 15.6$ square inches, and if a square core is going to be used it should be built up of thin laminations 4 inches wide, and built up to about 10 per cent greater cross-section than computed, namely, 17.86 square inches.

For purposes of ventilation it is better to keep the number of layers at a minimum without making the magnetic path too long. Let the number of layers equal 6, let the copper losses in the primary equal those in the secondary and let the combined copper loss equal 6 per cent. Let the iron loss equal 4 per cent. The capacity of the transformer is 60 watts, thus the primary current at full load is $60 + (60 \times 10/100)/110 = 0.6$ ampere. Since the watts lost in the primary equal 3, the drop in volts in primary $= 3/0.6 = 5$ volts, and the resistance of the primary coil $= 5/0.6 = 8.32$ ohms. And by the same method the resistance of the secondary is found to be 0.05 ohm.

The mean length of one turn is about 24 inches and the total length of wire required for the primary coil $= 220 \times 24/12 = 440$ feet. Referring to wire tables, No. 23 B. & S. gauge wire should be used.

For the secondary coil, neglecting losses, the number of turns will be 12, but if 6 volts is desired at full load, the secondary should have 13 turns. The mean length of one turn on the secondary is the same as that on the primary, and the length of wire required $= 13 \times 2 = 26$ feet. Referring to wire tables a length of 26 feet having a resistance of 0.05 ohm is No. 13 B. & S. gauge copper wire.

Make two cores 4x4 inches square and 4 inches long; on one wind the primary coil, and on the other wind the secondary coil. Make two laminated end pieces of the same cross-section and 11 inches long. These pieces are used to connect the two cores together at the ends, thus forming a closed magnetic circuit. The whole must be placed in a frame so that pressure can be brought to bear upon the joints to insure good contact and low reluctance.

The foregoing should enable the builder to vary the design to suit his own personal tastes.—J. H. McI., Sharon, Pa.

BOOK REVIEWS

"Illuminating Engineering Practice." New York: McGraw-Hill Book Company. Cloth, 578 pages (6x9 inches), illustrated. Supplied by Electrical Review Publishing Company, Monadnock Block, Chicago, for $5.00.

This book contains in a single volume the series of lectures by eminent illuminating specialists that was delivered last September at the University of Pennsylvania under the joint auspices of the Illuminating Engineering Society and the University. This series of 22 lectures was conceived as a supplement to a similar course undertaken jointly by the Illuminating Engineering Society and Johns Hopkins University in the fall of 1910. This first series dealt more particularly with the scientific aspects of illuminating engineering, whereas the second series, delivered last year, emphasized the practical aspects of the subject. Both series were very popular and serve to crystallize into more concrete form the general scope of the science and art of illuminating engineering. To meet the widespread demand for a permanent record of the first series of lectures they were published in two volumes. The present volume is the permanent record of the last series and has been gotten up by an experienced book-publishing house in accordance with the highest standards of publishing practice.

There are two prefaces, one by Dr. Hyde, who was chairman of both the 1910 and 1916 lecture committees, and the other by Dr. Steinmetz, who was president of the Illuminating Engineering Society when the 1916 lecture course was prepared and delivered. An outline of the opening exercises at the Philadelphia lectures is given. It is not necessary to review the lectures, which were abstracted in consecutive issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN from September 30 to October 30, 1916. The subjects and lectures were as follows: Illumination Units and Calculations, by A. S. McAllister; Principles of Interior Illumination (in two parts), by J. R. Cravath, Ward Harrison and R. F. Pierce; Principles of Exterior Illumination, by Louis Bell; Modern Photometry, by Clayton H. Sharp; Recent Developments in Electric Lighting Appliances, by G. H. Stickney; Recent Developments in Gas Lighting Appliances, by R. F. Pierce; Modern Lighting Accessories, by W. F. Little; Light Projections—Its Application, by E. J. Edwards and H. H. Magdsick; Architectural and Decorative Aspects of Lighting, by Guy Lowell; Color in Lighting, by M. Luckiesh; Church Lighting Requirements, by E. G. Perrot; Lighting of Schools, Libraries and Auditoriums, by F. A. Vaughn; Lighting of Factories, Mills and Workshops, by C. E. Clewell; Lighting of Offices, Stores and Shop Windows, by Norman Macbeth; Lighting of the Home; Lighting of Streets (in two parts), by Preston S. Millar and C. F. Lacombe; Railway Car Lighting, by George H. Hulse; Lighting of Yards, Docks and Other Outside Works, by J. L. Minick; Sign Lighting, by L. G. Shepard; Building Exterior, Exposition and Pageant Lighting, by W. D'A. Ryan.

Each of the lectures is copiously illustrated, the halftones being printed on glare-free paper in pleasant contrast to the usual practice. A large number of fine colored views of the San Francisco Exposition lighting are reproduced with Mr. Ryan's lecture. Fifteen pages of illustrations of exhibits that were made at the time of the lecture course are also included at the end.

This book makes a most valuable addition to the literature on illuminating engineering, by bringing down to date the best practice in this steadily broadening science and art. The subjects chosen for the lectures cover a wide range of the principal illuminating problems met with and, being discussed by authorities on the subject with the further general backing of the Illuminating Engineering Society, form a most excellent review of the best practice in this important field. The lecturers, the Society and University, the editor of the published lectures and the publishers are to be congratulated on getting together in such attractive form so much valuable technical material.

"Official Auto Wiring Guide." Chicago: International Motor Institute. Buckram, 500 pages (6½x10 inches), illustrated. Supplied by Electrical Review Publishing Company, Monadnock Block, Chicago, for $7.50.

One need not have a long memory to recall when the first automobiles were equipped with electric lights. A few years later saw the advent of the storage battery as regular equipment of practically all makes of gasoline cars. This practical and timely device made possible the use of the electric starter, and today there is scarcely a car that does not carry electric lights and starter as regular equipment. This industry has grown so rapidly that it has indeed been a difficult matter for owners, garage operators, dealers and repairmen to keep up with the many changes and improvements, as well as the different new equipments that were being perfected and placed on the market. Today there are more than 20 different makes of electric starting and lighting outfits used as a standard equipment on the many makes of cars now being built. Cars of different makes, but using the same electric system, are wired differently, in some detail or other, until it is impossible for a mechanic to understand the circuits and wiring of but a very few cars. This condition has developed a need for wiring diagrams covering the various cars and the different systems of starting and lighting equipment.

The book before us is the first to recognize this great demand and to fully meet it. This guide is in blue-print form, and contains nearly 500 pages, showing complete and guaranteed accurate diagrams of all makes and models of gasoline cars, and of all makes of electric lighting and starting equipment. In addition there is a section covering the operation, care and repair of batteries based on the latest approved practice. This guide has evidently been many months in the making and was compiled by one of the foremost battery and automobile electrical experts. The book is brought down to include 1917 cars and equipment. This guide should fill a long felt want, for with it a mechanic can tell at a glance the wiring circuits, connections, etc., of any make of car, thus easily locating any trouble to the wiring system. In addition there is a list of fuses for any car, as well as other valuable data.

Export Licenses Required.—The proclamation by President Wilson of an embargo on certain exports effective July 15 requires that exporters must secure from the Bureau of Foreign and Domestic Commerce, or its local offices in the largest cities in the country, export licenses in the application for which it is necessary to state the quantity and character of the goods, as well as name and address of the consignee.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Apex Domestic Mangle or Ironing Machine.

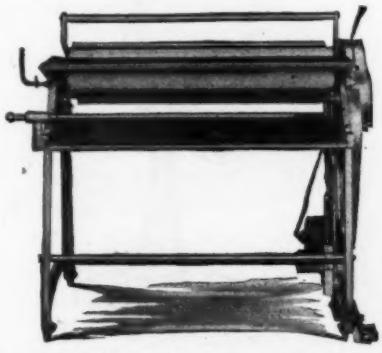
The electrically driven ironing machine developed by the Apex Appliance Company, 3223 West 30th Street, Chicago, will, it is claimed, iron perfectly everything in the average family washing except the most elaborately ruffled gowns and lingerie. For fine lace and embroideries it is claimed to be superior to the hand iron as the entire article is pressed at one time and there is no pulling or drawing.

The principle upon which the Apex ironer operates is the same as that of the hand iron except that the action is reversed. Instead of rubbing the iron on the goods, the goods are pressed against the ironing surface.

The polished ironing surface or "shoe" is curved so that when set in position its entire surface presses firmly against the padded roll which carries the clothes over the ironing surface. The shoe is heated by units which are located inside the shoe. These heating units can be either gas or gasoline burners or electric coils, as desired. They are arranged so as to maintain an even heat over the entire surface of the "shoe."

Two foot pedals are provided to throw the shoe against the roll and release it. The hands of the operator are thereby freed for handling the clothes. A handbar is also provided at the top of the machine which can be used for the same purpose. As the action of the foot pedals and handbar are interchangeable, pressure applied by the foot may be released by hand or vice versa. Wherever the operator may be standing in relation to the machine she has the shoe under instant control by at least one of the control levers or pedals. The shoe is so arranged that it can be swung away from the roll a distance of four inches to permit of easy cleaning and waxing of the rolls.

All parts of the machine are metal with the exception of the padded roll and feed board. The gears



Electrically Driven Mangle or Ironing Machine.

and belts are inclosed by guards. The machine is 47 inches high and the roll is 44 inches in length. The machine is belt-driven by a Robbins & Myers motor. If desired, it can be equipped to operate from the washing-machine motor.

New Electrolier Pull Switches.

The contractors and electricians are generally familiar with the pull switches of the "New Wrinkle" line, which have been made for a number of years by the Bryant Electric Company, Bridgeport, Conn.

Bryant Two-Circuit Electrolier Pull Switches.

These switches have been furnished heretofore, however, only in the single-pole construction. There have now been added to this type switches for two-circuit service making electrolier connections—and this without increasing the over-all dimensions of the switch. Successive pulls of the operating chain will light, respectively, the lamps on circuits 1, 2, 1 and 2 and then turn all off.

This switch can be used, of course, with any of the 41 caps and bases of the standard New Wrinkle line, being interchangeable with any of the other New Wrinkle bodies.

For use in fixtures, a more compact design is provided with a threaded shoulder at the bottom, which passes through an opening in the fixture shell. A knurled locknut turned up on the shoulder fastens the switch securely in position.

These switches are all National Electrical Code standard and have an approved rating of three amperes, 125 volts, or one ampere, 250 volts.

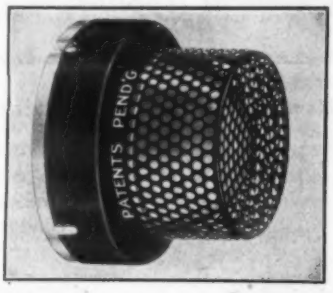
Automatic Fire Detector.

The Mizpah automatic fire detector is a compact little device marketed by the Automatic Fire Detector Company, Incorporated, 1834 Broadway, New York City, to be used in dwellings, factories, warehouses, piers, etc., to give warning, by means of any alarm or annunciator system to which it may be connected, of a fire in its early stages so that a fire-extinguishing equipment can be brought into use before the fire passes beyond the first critical few minutes. The device gives the alarm in ten to thirty seconds.

It is automatic in its action and takes care of the usual changes of temperature occurring within the room or inclosure in which it is located without sending in an alarm. This is accomplished by means of

a compensator which is part of the device. The principle of operation is as follows:

The detector consists of a hemispherical air reservoir, the flat side or top of which is formed by a flexible diaphragm. This reservoir contains air at atmospheric pressure. When the surrounding atmosphere rises in temperature quickly, the air in the



Mizpah Automatic Fire Detector.

dome is heated and expands, causing the diaphragm to project outwardly and close an electrical contact, which acts as a switch closing the circuit of whatever fire-alarm system it is connected with.

To prevent false alarms being turned in due to the natural changes of temperature within the inclosure in which the detector is located, a simple compensator is made part of the device. This compensator allows for a predetermined amount of leakage so that as long as the pressure within the dome is not raised by the outside heat too quickly, the air can escape, thus preventing the diaphragm from being pushed outward. This compensator is regulated so that a rise exceeding approximately three degrees per minute will cause an alarm to be rung in. Experience shows that any heating appliance raising the temperature faster than the above adjustment is abnormal. Where this unusual condition exists, special adjustment can be made to meet it.

In private dwellings the device can be attached to the regular push-button service in the house, thereby making use of the present wiring and annunciators already installed, or it can be installed complete with its own system of wiring and alarm.

The manufacturers recommend that the detectors be placed on the ceiling or high portions of the rooms or inclosures and, unless special conditions exist, one detector will take care of 200 or 300 square feet. The device is thoroughly protected against injury by a guard, which is placed over the sensitive portions. The base of the detector is about 4 inches in diameter and the guard is about 3 inches in diameter, extending beyond the base about 1½ inches.

It is claimed that through using air as a medium by which to operate the detector, use is made of an element more sensitive and far more rapid than any metal would be and that this also overcomes the disadvantage of thermostatic alarms, which only have a fixed expansion, allowing for no compensation, which would require the detector being set for a high temperature to take care of the abnormal conditions, thereby depriving it of its sensitiveness, when the usual cause for the high temperature in that inclosure is not in operation.

The company also makes a portable equipment consisting of a small bell and battery box, connected to the detector with 6 feet of flexible cord, to be used for temporary protection by travelers where emergency justifies its use.

New Electric Air Heater.

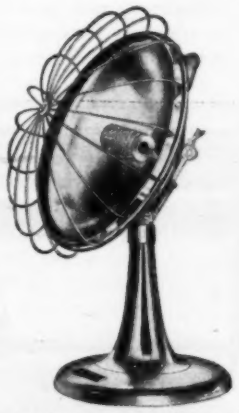
Efficiency in modern life requires one to look and plan ahead. Thus, in midsummer thought must be given to provision for the approach of fall and early winter with mornings and evenings too cool for comfort but not cold enough to start up the house-heating plant in regular use during the coldest weather. For this intermediate season electric heaters have been found very helpful in taking the chill from rooms before retiring or when rising. They are also useful in bathrooms and other small rooms at all times when the regular heating equipment does not provide sufficient heat.

A new heater for this purpose has been placed on the market by the Hotpoint Electric Heating Company, Ontario, Cal. The electric radiator made by this company under the name El Radio has proven very popular, but for some purposes it has been felt that a still more compact and concentrated heater would be found especially suitable. As shown in the accompanying illustration, this heater is built with a parabolic reflector adjustable as to angle so that the heat can be readily directed horizontally or in any upward direction; for this reason and on account of its shape it is known as the "Hedlite" heater.

It is made of pressed steel throughout, making it very light and portable. The reflector has a very heavy triple coating of copper that is highly polished so that with the glowing heating element in its center it makes a very cheerful source of heat. The back of the reflector is finished in black enamel and has an ebonized wood handle for carrying the heater comfortably.

The heating element consists of a considerable length of resistance wire wound over a composition core one inch in diameter; the wire itself is first coiled like modern tungsten filaments, thus making a very compact element placed at the focus of the reflector. The element is designed for 600 watts on standard voltage. A strong wire guard protects the element; it is easily removed for cleaning the reflector.

A strong steel base is provided for the outfit. It is so weighted that should it be upset the heating element will be turned upward; this eliminates all danger of the element causing any fire hazard while current is



New Hotpoint "Hedlite" Heater.

on. Both base and upright are highly nickel-plated. The entire weight of the heater is only about four pounds. The reflector diameter is 9½ inches and the outside diameter of the wire guard is 11 inches. The standard Hotpoint switch plug and 10-foot cord are supplied with each heater.

TEMPERATURE INDICATORS FOR LARGE ALTERNATING-CURRENT MACHINES.

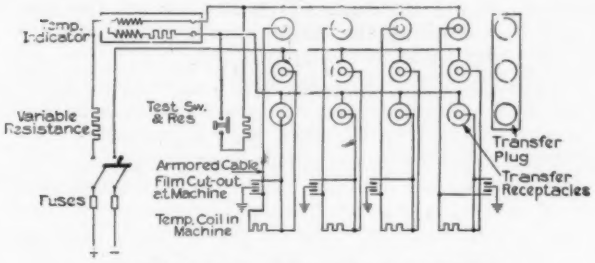
Important Development for Preventing Burnouts of Generators, Converters and Other Machinery.

The General Electric Company of Schenectady, N. Y., has developed temperature indicators which

Standard Temperature-Indicating Panel.

when used in conjunction with temperature coils in the machine itself afford a convenient and rapid means of indicating continuously at the switchboard the temperature of various portions of the windings of electrical machinery under operating conditions. In accordance with recommendations of the American Institute of Electrical Engineers, it is now standard practice to furnish temperature coils with all alternating-current machines having a stator core of 20 inches or more in width, a voltage rating of 5,000 or higher, or a capacity of 500 kilovolt-amperes or greater.

The G-E temperature indicator is a direct-current differential indicator with three terminals. Operation depends on the variation of resistance of a copper resistor placed in a slot of the machine stator in contact with the insulation of the winding, or in any location, external or internal, where the resistor may be protected from the conductors by means of suitable insulation. The increase or decrease of temperature

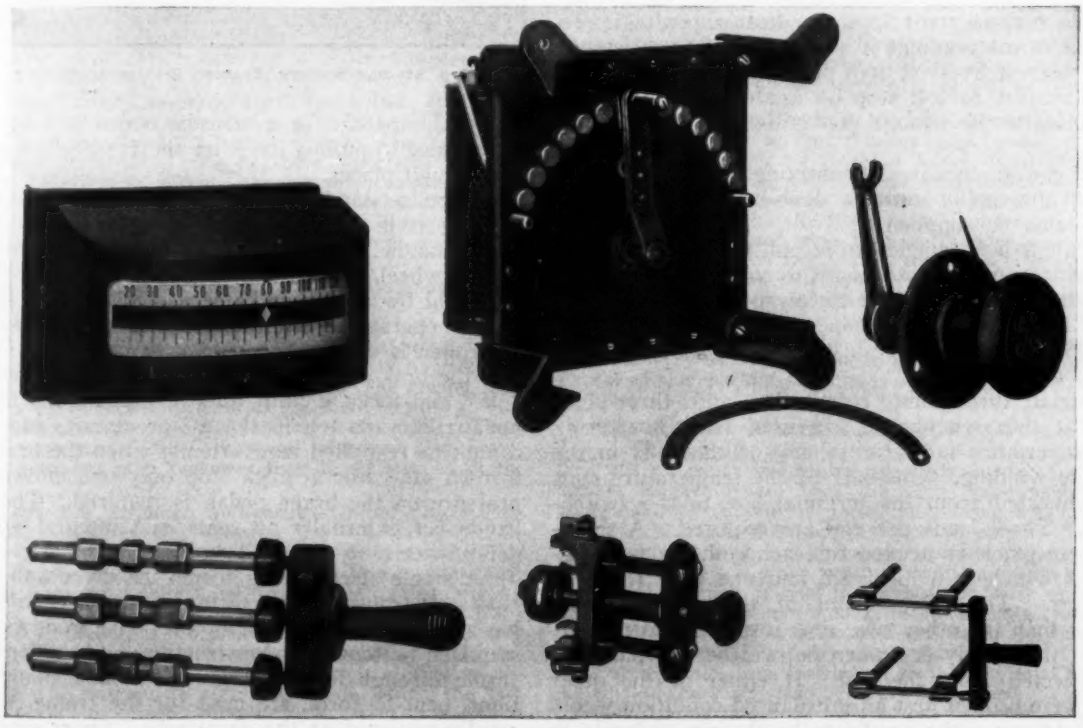


Connections for Temperature Indicator.

of the windings causes a corresponding change in resistance of the coil, which is indicated by a sensitive instrument, the graduated centigrade dial of which shows directly the temperature of the windings.

For machines from 500 to 3,125 kilovolt-amperes four coils are used, two of which are considered as spares. Above this rating, six coils are used, three of which are spares.

One of the windings of the temperature indicator is in series with a coil of manganin, having a resistance equal to that of the temperature coils (usually at 80 degrees centigrade). The other winding is in series



Temperature Indicator and Equipment for Use Therewith on Switchboard.

with the temperature coil itself. When the temperature in the copper coil rises, the current in the branch of the circuit carrying the temperature coil decreases, causing a corresponding deflection toward the higher temperature markings on the indicator scale. The reverse occurs when the temperature of the temperature coil falls. The scale of the standard instrument is adjusted with a range of 20 to 120 degrees centigrade or 0 to 90 degrees and marked in one-degree divisions.

The temperature coils are made of copper wire wound in a thin form and pressed flat so as to be non-inductive. The temperature coils in the machine windings are connected by a three-conductor armored cable to a combination terminal and cutout box mounted on the machine. This box carries the terminals for attaching the leads from the coil and for the extension leads to the instrument.

A protective device is mounted in the above mentioned box. It consists of six pairs of film disk cutouts supported by spring clips with a grounding connection between them, the spring clips being connected to the terminals of the coil. The cutouts furnish protection to the operator in case a coil becomes grounded to the power winding. Should the pressure between any temperature coil and the ground exceed about 400 volts, the insulation in the corresponding film will break down, removing the high potential from the temperature coil, but bringing the machine winding to ground.

The whole indicator outfit is connected through instrument fuses across a 125 or 250-volt direct-current source. A variable resistance with dial switch and index is used to make up for variations of the voltage of the supply circuit, especially when voltage regulators are used with the exciters. In some instances it is desirable to use a fixed resistance, but this should be done only when investigation shows that the direct-current voltage does not vary on either side of normal more than 2½ volts for 125 volts and 5 volts for 250 volts. A greater variation in the supply voltage introduces serious error in the indicator reading. To obtain accurate readings it is best to set the resistance to the nearest five-volt step on a 110-volt circuit and to the nearest 10-volt stop on a 220-volt circuit corresponding to the voltage that is used on the exciting circuit.

For convenience in disconnecting the indicator outfit from the supply source a double-pole, single-throw switch may be supplied.

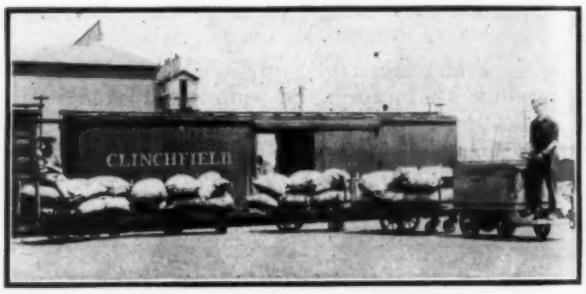
A single-pole, single-throw pull-button test switch is provided on the switchboard to connect occasionally a resistance in multiple with any of the temperature coils. If the outfit is in proper working order, closing this switch will cause the instrument to show a reduction in the reading.

Special three-point receptacles and three-point plugs at the switchboard are used for transferring the temperature indicator to any of the coils in the machine winding. One-half of the temperature coils are connected from the terminal box to the switchboard. Three leads per coil are required. A three-point receptacle is needed for each coil, the temperature of which is to be read, and one plug for each indicator. The center point of the plug is made shorter than the other two, thus insuring that the circuit of the supply is broken before the instrument is disconnected from the coil. If either of the other leads were broken first an unbalanced condition would exist and cause the needle to be thrown violently to one side or the other.

Lansing Industrial Electric Tractor.

For intensive handling of freight through short distances two methods prevail—one employing the load-carrying power truck, the other the tractor with trailers. The latter method, where it can be used, is more economical, for the tractor can be kept in operation all the time, only the less expensive trailers being delayed for loading and unloading. While many of the salient features of the tractor and load-carrying truck are identical, the tractor is essentially a locomotive with weight so placed as to give the greatest possible tractive effort.

The tractor shown in the illustration has been developed and placed on the market by the Lansing Company, Lansing, Mich., after a comprehensive study of problems involved in the short-haul movement of materials. Two sizes are manufactured having a rated capacity of trailer load of 5,000 and 12,000 pounds, respectively. The motor and control equipment, furnished by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is designed especially for this type of service. Its most important feature is the dividing of the battery into two parts connected in parallel, thus requiring resistance in the circuit only on the first notch of the controller. This means that resistance losses are reduced to a minimum, and that there is ample current capacity available for the heavy duty of starting a string of loaded trailers. While fully inclosed, the motor may be opened readily for inspection. Its ruggedness gives



Lansing Storage-Battery Tractor in Use Unloading Cars.

it liberal capacity for overloads, which is a factor of importance in pulling loads up short, steep grades and over rough places.

When a standard automobile wheel is used for steering it is at the operator's right, with the controller handle. A lever, at the left, may be substituted for the wheel. The brake pedal is under the left foot; it is held by a latch and released by a slight shifting of the operator's foot. Interlocking of brakes and controller is a feature peculiar to this tractor. Setting the brakes automatically throws the controller to "off," and locks it until they are released. There is no auxiliary switch in the motor circuit, and power cannot be reapplied inadvertently when the brakes are thrown off. For a quick stop only one movement, a pressure on the brake pedal, is required. The brake bands act externally on seats cast integral with the drive wheels.

A single steel casting forms the drive axle; it incloses all transmission gearing in an oil chamber and has a bracket to carry the motor. The front axle is of standard automobile construction and supports the frame through leaf springs. Four-inch channel sections, bent to form, are used for the frame, which is rigidly mounted on the drive axle. Short wheel base and small over-all dimensions make turning easy.

Activities in the Trade

The **Perfect Fuse Company,** Buffalo, N.Y., has increased its capital from $10,000 to $100,000 for expansion.

The **Electric Hose & Rubber Company,** Wilmington, Del., will build an addition to its plant at Eleventh and Dure Streets for increased capacity.

Western Electric Company, 195 Broadway, New York City, announces that A. C. Cornell, formerly of its St. Louis sales organization, has been appointed sales manager of its Denver office.

The **A. B. See Electric Elevator Company** has removed its Philadelphia, Pa., offices from the Land Title Building to the Colonial Trust Company Building, Thirteenth and Market Streets. George T. Atkinson is local manager.

McGill Manufacturing Company, Valparaiso, Ind., calls attention to the Loxon lamp guard, which does the double duty of preventing theft of lamp and protection against breakage. These guards are listed by numbers to fit the numerous Mazdas from 15 watt to 200 watt.

Pass & Seymour, Inc., Solvay, N. Y., is erecting a three-story, reinforced-concrete addition to its plant. The structure will provide an additional area of about 50,000 square feet for manufacturing and will be used to increase the present capacity. It is estimated to cost $100,000.

The Electro-Dynamic Company, North Street and Avenue A, Bayonne, N. J., manufacturer of electrical machinery, has awarded a contract for the erection of a one-story, reinforced-concrete addition to its plant to cost about $50,000. John W. Ferguson, Paterson, is the contractor.

P. F. Apfel, president and manager, Electric Sales Corporation, Henry Building, Seattle, has been awarded a contract by the school board at Paul, Idaho, for the installation of Apfel's system of electric heating in the new high school building. E. H. Gates of Twin Falls, Idaho, is the architect.

The Solvay Process Company, Syracuse, N. Y., presents much interesting and useful information in a 56-page pamphlet, concerning the development of the soda process and the equipment of the company's plants. The ten principal Solvay products are described chemically, and their numerous uses are set forth. Much data are tabulated, and numerous illustrations are given.

George Cutter Company, South Bend, Ind., announces the addition to its sales organization of J. H. Lynch, who will operate from the company's branch office in New York City. For fifteen years Mr. Lynch has been associated with the electrical industry, as a central-station man, contractor and salesman. During the last five years he has been connected with the Buffalo office of the Westinghouse Electric & Manufacturing Company and has made many friends in the electrical trade in the eastern territory.

Calebaugh Self-Lubricating Carbon Company, with offices at 1503 Columbia avenue, Philadelphia, Pa., announces that in order to meet the demands of a greatly increased volume of business, the company's plant, after August 1, will occupy quarters at 1508-10-12-14-16-18 Columbia Avenue, that city, the business offices remaining at 1503. The greater floor space serves to increase facilities for manufacturing "No-Spark" carbon brushes used on generators and motors. These products have proved satisfactory and sales have been heavy. The company has sales representatives in all sections of the country.

Jitneys Are Enjoined in Seattle.—United States District Judge Neterer has granted the application for a temporary injunction against 179 jitney drivers, asked for by the Puget Sound Traction Light & Power Company, declaring that until they have filed bonds as required by law they have no right to interfere with the rights, franchise and privileges of the plaintiff. Upon the disclosures made, the court held that there is no authority for operating free busses and that such conduct is clearly an invasion of the company's rights and one which the law will not permit or countenance.

National Lamp Works of the General Electric Company, Cleveland, Ohio, is contemplating the erection of a factory in Chicago. It is reported that a tract of land 233 by 132 feet has been purchased on the west side of Chicago and that a factory will be built if the necessary arrangements can be made with the City Council.

Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa., issues the first number of a series of pamphlets on Railway Engineering Data, intended to supply reliable information on electric traction matters. The scope of the series is limited to equipment application problems which arise in the equipment and operation of city and interurban electric roads. The pamphlet contains cuts and drawings to illustrate the subject matter. This pamphlet is supplemented by a booklet on Electrification Data, as applied to state and interstate railways. The Westinghouse company also has issued illustrated filing sheets on Oil Circuit-Breaker Accessories.

Traction Company Buys Coal Mine.—The International Traction Company, a subsidiary of United Gas & Electric Company, has bought a coal mine in the Pittsburgh district and will hereafter be able to furnish its New York State railway lines with adequate coal supplies at normal prices. The mine is now running at a capacity of 150,000 tons annually. Of this amount the traction lines will consume about 50,000 tons, leaving the surplus available for sale. Several contracts have been made to take care of the surplus coal at prices which are said to be very favorable to the owners. The mine was taken over on June 1.

United Gas & Electric Engineering Corporation, New York City, closed a contract with the Sheldon Axle & Spring Company, Wilkes-Barre, Pa., for supplying 2100 horsepower for motors, 100 kilowatts for lights and 100 kilowatts for electric welders. Included in this installation is a 300-horsepower synchronous motor-generator set to supply direct current for cranes. Previous to making these electric power installations the latter company had been operating by steam power; but about 600-horsepower boiler capacity will still be utilized for steamhammers and for heating. The former company's 11,000-volt lines will be extended to the Sheldon plant, where 2500-kilovolt-ampere stepdown transformers will be required.

American Pipe Bending Machine Company, Boston, Mass., manufacturer of the "Wonder" pipe bender of several different models, recently issued a folder, illustrating these machines, and calling attention to conspicuous work performed by them. Especial attention is called to the new buildings of Massachusetts Institute of Technology, in which the miles of pipe used were bent by Wonder pipe benders. The bending of steel, iron, brass and copper pipe, without cracking, crimping or weakening is regarded one of the difficult problems in pipe-fitting, and this was accomplished in the buildings named to the satisfaction of Stone & Webster Engineering Corporation, by which they were constructed after plans by W. W. Bosworth, architect, New York City. By use of this machine the pipe is bent cold, without treating or filling.

The Harvard Electric Company, 525 W. Van Buren Street, Chicago, Ill., manufacturers of Harvard pocket battery meters, which are high grade instruments of the permanent magnet type. They are light, handsomely nickel plated, and of convenient pocket size, being 2¼ inches in diameter, ⅝ inches thick, and 4 ounces in weight. They are accurately calibrated, and guaranteed for two years. Neither the temperature nor other weather conditions affect their accuracy. They may be read in any position, with or without the use of the flexible cable. The ammeters are used for testing dry cells. They indicate the direction of current as well as its strength, and are nearly "deadbeat." A flexible cable accompanies each instrument so that the total effect of the whole battery may also be easily determined. A new circular illustrating the above material has just been issued.

Personal and Biographical

W. H. QUIRK has been appointed manager of the Western Electric Company's branch house at Cincinnati, O. W. L. Sioussat will succeed Mr. Quirk as stores manager in the company's Cleveland house.

M. J. VERNON has become manager of the Rapid City, S. D., exchange of the Nebraska Telephone Company. He formerly was manager of the company's business at Sturgis, S. D.

DAVID SARNOFF, commercial manager for the Marconi Wireless Telegraph Company of America, was married to Miss Lizette Hermant of New York on July 4. A reception and dinner at Broadway Central Hotel followed the wedding.

W. L. SIMPSON has been advanced to the position of division electrical engineer of Postal Telegraph-Cable Company, Chicago, succeeding H. C. Shaw, who has been transferred to a similar position in San Francisco. Mr. Simpson, for three years prior to his recent appointment, was assistant to Mr. Shaw at the Chicago office.

W. LAWRENCE WESTON was recently transferred from the management of the Paducah, Ky., Light & Power Company, to the management of the Stone & Webster utilities, Houghton, Mich. He is now general superintendent of the Houghton County Electric Light Company.

T. O. KENNEDY, for the past three years general manager of the Massillon, Ohio, Electric & Gas Company, has been been made general superintendent of the Denver Electric Light & Gas Company. Mr. Kennedy gave a farewell dinner to about forty of his friends on the eve of his departure from Massillon.

T. E. BURGER has resigned as assistant sales manager at San Francisco of the Western Electric Company and is now manager of the Baker-Joslyn Company, Los Angeles, Cal. Mr. Burger was with the Western Electric Company at Los Angeles until a few months ago when he was promoted and transferred to San Francisco.

C. U. PEELING, local manager of the electric light and gas properties at Oshawa, Ont., has been appointed manager of the Cornwall Street Railway, Light & Power Company, Ltd., and the Stormont Electric Light & Power Company, Ltd., at Cornwall, Ont., succeeding William Hodge.

FRANK BINKLEY, formerly of Hamilton, Ohio, has become manager for the United Telephone Company at Bellefontaine, that state.

D. HUDSON lately was elected vice president of the Fort Scott Gas & Electric Company, Fort Scott, Kansas, succeeding E. C. Gates.

H. H. BECHTEL has been appointed secretary of the Twin State Gas & Electric Company, Brattleboro, Vt., succeeding G. L. Halstead.

E. C. MACY has been appointed engineer of the Stone & Webster division of construction and engineering, with headquarters in Seattle, Wash., succeeding W. L. Locke.

W. N. MATTHEWS, who was elected president of the St. Louis Jovian League at its meeting on July 20, is widely known as a past Jupiter of the Jovian Order, having held this office during the

W. N. Matthews.

1915-16 term. During his administration the Order made tremendous gains in membership and otherwise made substantial progress. Mr. Matthews is president of W. N. Matthews & Brother, prominent St. Louis electrical manufacturers.

H. C. SHAW, until recently division engineer for Postal Telegraph-Cable Company at Chicago, has gone to San Francisco to assume the duties of electrical engineer for the Pacific division of the same company. Mr. Shaw has been with the Postal Telegraph-Cable Company since 1894, having served as manager at La Junta, Colo., and Salt Lake City, successively, and was division engineer at San Francisco before being transferred to Chicago in 1911.

E. C. DEAL, of Baltimore, Md., has been appointed manager of the Trinidad Electric Transmission, Railway & Gas Company of Trinidad, Colo.

EDWARD C. STOKES, Trenton, N. J., former governor, has been appointed domiciliary receiver for the International Power Company, New Jersey.

C. H. KELLEHER, for some time engineer of the Colorado Power Company's plant at Leadville, Colo., has been transferred to the company's main plant at Shoshone, Colo.

JAMES H. CLARKE, associated with the Public Service Electric Company, Bayonne, N. J., has been appointed an electrical sergeant of the Thirteenth Artillery, New York.

A. W. CRISS, formerly construction engineer for the Milwaukee railroad in Montana, recently was appointed superintendent of ways and maintenance for the Butte Electric Railway Company, Butte, Mont.

CLYDE TAYLOR, general counsel for Kansas City (Mo.) Railways, was recently elected vice president. In the absence of the president, Col. P. J. Kealy, in the army, Mr. Taylor assumes the duties of president. Col. Kealy's place on the board of control will be taken by Chester C. Smith, assistant to the president.

B. T. BURT, who for the past two years, has been vice-president and general manager of the Rutland Railway, Light & Power Company, Rutland, Vt., has accepted a position as assistant to the chief executive of the Mexican Light & Power Company, Mexico City, Mexico. Mr. Burt will assist in the management of the engineering and operating departments of the Mexican and subsidiary companies.

W. C. KLEIN, recently appointed master mechanic of the Easton (Pa.) Transit Company, formerly was with the Metropolitan Street Railway, New York City, and later was with the Albany & Hudson Railroad. After several years in that position he engaged in shop work two years with the General Electric Company. He then took up railway work again in New York, as shop foreman and draftsman for the New York Railways, and in 1912 and 1913 he was with the Federal Storage Battery Company. Prior to his last appointment he was general inspector for the Brooklyn Rapid Transit System.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

HARTFORD, CONN.—The Hartford Electric Light Company, 266 Pearl Street, voted to increase its capital stock from $4,500,000 to $6,000,000 and will install a 30,000-kilowatt turbine in its plant at Dutch Point. F. M. Wilbraham, superintendent.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company is making rapid progress in the erection of an addition to its plant. Foundation footings for new equipment and other work is well under way and it is planned to place the new 5,000-kilowatt unit in place at an early date, as well as new boilers.

DEPEW, N. Y.—The Public Service Commission has granted permission to the Depew & Lancaster Light, Power & Conduit Company to issue bonds for $100,000 and stock for $45,000 for extensions and improvements, including equipment.

LOCKPORT, N. Y.—The Lockport Paper Company, which is electrifying its paper mill throughout, has signed a contract with the Lockport Light, Heat & Power Company to supply the required power service. It is reported that the initial load of 300 horsepower will be increased to about 1,500 horsepower by January 1. These installations mean the disuse of the paper company's steam plant.

LOCKPORT, N. Y.—The Public Service Commission has inaugurated a series of hearings at Albany to investigate the rates of the Lockport Light, Heat & Power Company. Citizens and local civic organizations are seeking an appeal from the commission's decision of July, 1915, granting the company permission to increase its rates, with the establishment of a uniform charge of 6 cents per kilowatt-hour.

LONG ISLAND CITY, N. Y.—The Long Island Lighting Company has made application to the Public Service Commission for permission to issue $130,000 first mortgage bonds and $100,000 in capital stock for reconstruction and improvements, including new equipment, and for working capital.

NEWTON FALLS, N. Y.—The Newton Falls Paper Company will build a new hydroelectric power plant at Newton Falls to develop electric power for works operation. The plant will cost about $50,000. C. E. Easton, Sherman Block, Watertown, N. Y., is engineer.

NEW YORK, N. Y.—The Central Park West Civic Association is planning for the installation of an ornamental street-lighting system in the Central Park, west section.

ROCHESTER, N. Y.—The Symington-Anderson Company is being organized to carry out a contract which T. H. Symington & Company made with the Government for the building of 3,000 field guns of 75-millimeter type, amounting to between $26,000,000 and $30,000,000. The new company will build a plant near that of T. H. Symington & Company, capable of producing ten field guns per day. This plant is to be completed by November 1.

BAYONNE, N. J.—The Downtown Business Men's Association is negotiating with the City Commission for the proposed extension to the street-lighting system on Broadway, from Fifth to Eleventh Street. The installation will be made by the Public Service Electric Company.

COLLINGSWOOD, N. J.—The South Jersey Radio Association is planning for the establishment of a school of instruction in the E. C. Knight High School. The course will be open to any one becoming a member of the association on the payment of a nominal due of 10 cents a month. H. W. Densham, secretary, formerly with the Marconi Wireless Telegraph Company, has been appointed chief instructor; Howard Shallcross will be assistant instructor.

DOVER, N. J.—The McKiernan-Terry Drill Company is installing motors of 65 horsepower in the addition to its building, current for which is to be supplied by the New Jersey Power & Light Company.

NEWARK, N. J.—The Board of Freeholders will receive bids until 3:30 p. m., August 1, for extensions and improvements in the electric power plant at the Essex County Hospital, Overbrook. Runyon & Carey, 845 Broad Street, are consulting engineers.

ORANGE, N. J.—The City Commission is considering the installation of additional street lights on Main Street. The Merchants' Association is interested in the improvement.

PHILLIPSBURG, N. J.—The Phillipsburg Transit Company has made application to the Public Service Commission, Pennsylvania, for permission to operate at Easton, Pa., and vicinity.

POMPTON LAKES, N. J.—The proposed hydroelectric power plant to be installed by the borough council on Pompton Lake is estimated to cost about $35,000. The site is expected to develop about 250 horsepower at low-water periods, with greatly increased capacity at other times. When necessary, it is proposed to raise the present dam for greater head. The plant will be used for municipal light and power service.

TRENTON, N. J.—The City Commission is planning for the early installation of ornamental iron poles for a lighting system in Mahlon Stacy Park. An order has been placed for the improvement.

TRENTON, N. J.—The City Commission is arranging with the Public Service Electric Company for the removal of poles on a number of city streets to be paved. Underground conduit systems will be installed to replace the overhead lines.

TRENTON, N. J.—The Board of Public Utility Commissioners has approved a merger of gas companies operating in Cumberland County, under the name of the Cumberland Gas Company. The new company will take over and operate the following: Millville Gas Light Company, Millville; Citizens' Gas Company, Landis Township; Citizens' Gas Light Company, Vineland; Commercial Gas Company, Maurice River Gas Company, Downe Township Gas Company, Lawrence Gas Company, Fairfield Gas Company, Deerfield Gas Company and the Pittsgrove Gas Company. The new organization is permitted to issue $200,000 in stock and execute a mortgage for $1,100,000.

HARRISBURG, PA.—The Public Service Commission has recently granted permission to the following public utility companies operating in the state to issue securities in the amount noted for reconstruction, improvement and extensions, as well as increased working capital: Erie Lighting Company, Erie, $1,650,000; Lehigh Valley Light & Power Company, Allentown, $135,000; Mahoning & Shenango Railway & Light Company, Mahoning, $500,000; Counties Gas & Electric Company, Philadelphia, $348,000; Gettysburg Electric Company, Gettysburg, $55,000; Penn Central Light & Power Company, Altoona, $271,000, and Scranton Electric Company, Scranton, $77,000.

HAZLETON, PA.—The Electric Bond & Share Company, 71 Broadway, New York, has completed arrangements for the acquisition of the Lehigh Navigation Electric Company, a subsidiary of the Lehigh Coal & Navigation Company; the Lehigh Valley Transit Company and the Northern Central Electric Company. The plants and systems will be consolidated and extended throughout the anthracite fields in this section. In company with Brown Brother Company, Edward B. Smith & Company, and Henry & West, bankers, New York, the Electric Bond & Share Company will issue notes for $20,000,000 to provide for the purchase and proposed improvements.

JOHNSTOWN, PA.—The Penn Electric Service Company has commenced the construction of a new power plant at Rockwood. The station will be tied in with the Connellsville plant and furnish service in the southern section of Somerset County.

LANSDALE, PA.—The North Penn & Buckingham Valley Railways Company is considering the construction of a new interurban line connecting Upper North Penn and Buckingham Valley districts, including Quakertown, Dublin, Glen, Almont and Blooming, with Doylestown and vicinity, about twenty-four miles.

LEBANON, PA.—Metropolitan Electric Company has contracted to deliver 300 horsepower to the plant of Whitehall Cement Manufacturing Company.

LEBANON, PA.—Lebanon Valley Electric Light Company has secured a contract to supply current for a 500-kilowatt converter in the mill of Lebanon Valley Iron & Steel Company.

PHILADELPHIA, PA.—The Philadelphia Electric Company is taking bids for the construction of a one-story, brick and concrete addition to its power station at Kensington Avenue and Tioga Street. The extension will be about 37x95 feet.

PHILADELPHIA, PA.—The Penn Chemical Company has filed plans for the construction of its proposed new power plant and engine house at 1326 Washington Avenue. Two one-story structures will be erected, 46x48 feet, and 18x43 feet, to cost $22,000. The Nickson-Duggan Company has the contract for erection.

QUAKERTOWN, PA.—At a special election, citizens have voted bonds for $45,000 for extensions and improvements in the municipal electric lighting plant.

READING, PA.—Republic Color & Chemical Company, which moved its plant from Boston to Reading, has signed a contract with Metropolitan Electric Company for 110 horsepower, continuous service.

WILKES-BARRE, PA.—With permission granted by the Superior Court to the Wilkes-Barre Lighting Company, recently organized to operate locally, annually an adverse ruling of the lower court, the City Council has announced intentions of awarding a contract to the company for street-lighting. On bids recently submitted the new organization has submitted prices lower than the Wilkes-Barre Company, now operating in the territory, totaling $33,000 on general street lighting and $7,000 for lighting standards, or a total saving of $40,000.

LAUREL, DEL.—The Eastern Shore Gas & Electric Company has announced a 10 per cent advance in light and power rates.

CECILTON, MD.—William H. Alderson and associates are organizing a company to build and operate an electric power plant for light and power service in this section.

ELKTON, MD.—Chesapeake & Potomac Telephone Company has purchased site and will erect a headquarters building at an estimated cost of $50,000.

RICHMOND, VA.—Hackley Morrison, 16½ North Ninth Street, is planning for the installation of a small electric lighting plant, and is reported to be in the market for a 10-kilowatt, 3-phase generator, six transformers and wire for pole line.

ROANOKE, VA.—The Norfolk & Western Railroad will build a power plant at Atkin for the operation of its new automatic electric signal system now being constructed between East Radford and Bristol.

CHARLOTTE, N. C.—The Southern Power Company is reported to be plan-

ning for extensions in its transmission lines to Greenville at an estimated cost of $30,000.

WARSAW, N. C.—The City Council has approved an appropriation of $15,000 for the installation of an electric lighting system.

FELLSMERE, FLA.—Bonds in amount of $20,000 were voted to purchase an electric light plant and ice-making plant.

ORLANDO, FLA.—The city contemplates installing an electric light and water-supply plant. Address Frank H. Williams, city clerk.

NORTH CENTRAL STATES.

CHILLICOTHE, O.—The Hillsboro, Cynthian Bainbridge Chillicothe Traction Company will issue $400,000 bonds to construct a line from Hillsboro to Chillicothe. Address J. C. Anderson, Chillicothe, secretary.

DAYTON, O.—The Dayton Metal Products Company plans to build a power plant. Estimated cost, $250,000. H. E. Talbott, president.

SANDUSKY, O.—Sandusky Gas & Electric Company will supply 52½ additional horsepower to Libby Glass Company, manufacturers of incandescent lamp bulbs, to run three additional machines.

BROCKTON, ILL.—Village plans to install municipal lighting plant and would like to receive from manufacturers catalogues of complete plants or separate apparatus. Preliminary information will be furnished for making estimates. Communication desired by mail only. Address P. V. Deames.

CHICAGO, ILL.—National Electric Lamp Association is reported having purchased a building site upon which to erect a factory. The ground purchased includes 233.8 feet of south frontage on Flournoy Street. Purchases were made by Edwin Irving of Cleveland.

GLADSTONE, MICH.—John F. Card and associates, controlling the Marble Arms & Manufacturing Company, are building a plant for the manufacture of dynamos and motors.

ASHLAND, WIS.—Wisconsin Telephone Company has commercial engineers at Ashland making a survey of the city with a view to increasing facilities to meet the present and prospective demands of business.

BEAVER DAM, WIS.—City Council proposes to purchase and improve the local lighting plant.

MANITOWOC, WIS.—City Council has given Wisconsin Public Service Company authority to extend its transmission lines into the city.

OSHKOSH, WIS.—Wisconsin Telephone Company is putting its service wires underground. Conduits for this purpose have been laid on Division Street and Central Avenue, and similar work is being done on Washington Street. Clay conduits are being laid, each one carrying six cables of 600 wires.

RACINE, WIS.—The Wisconsin Gas & Electric Company filed with the Secretary of State an amendment to its articles of incorporation, increasing the capital stock from $2,750,000 to $3,350,000.

GILBERT, MINN.—The Mesaba Railway Company contemplates replacing wooden poles with steel towers. Address Peter Cosgrove, superintendent.

HASTINGS, MINN.—Sealed bids will be received until August 6 for the equipment for pumping water to supply the water system at Hastings. Address J. H. Twichell, city clerk.

MONTROSE, IA.—Transmission line over which current from the Keokuk plant is to be supplied Montrose is completed.

SIOUX CITY, IA.—The Sioux City Gas & Electric Company will build a steel and frame addition to power plant. Address O. W. Harrod. engineer, who estimates the cost at $200,000.

VINTON, IA.—Iowa Telephone Company is putting in position a new switchboard, replacing one of out-of-date type.

BOWLING GREEN, MO.—Mrs. D'Arline Holcomb has bought the controlling interest in the Pike County Electric Light & Power Company and has assumed the management of the business.

GARDEN CITY, MO.—A new telephone system will be installed to serve Garden City, East Lynne and Latour.

GRANT CITY, MO.—The contract between the city and the Grant City Electric Light Company expires August 1, and a 5-year contract is proposed for the same number of lights now, with 24-hour service, at a rate of $125 per month.

POPLAR BLUFF, MO.—Southwestern Bell Telephone Company is rebuilding the system here. Cables and other material are on the ground for this work.

SEDALIA, MO.—The City Light & Traction Company will improve its plant on East Broadway at a cost of $60,000.

ABILENE, KANS.—Riverside Light & Power Company is putting up a 25,000-barrel oil tank of reinforced concrete. Oil will be pumped into the tank through a pipe line. The oil is for fuel for use in company's steam-electric plant.

ALTOONA, KANS.—Bids were opened July 17 for waterworks improvements estimated to cost $30,000. These include three centrifugal pumps, motor driven.

ARMA, KANS.—The Kansas Gas & Electric Company is to furnish the city with power for pumping water, and current for light.

GRENOLA, KANS.—A proposal to issue and sell bonds of the amount of $15,000 will be voted on at election August 4. The funds are for an electric light plant.

HARDTNER, KANS.—Capron is to be supplied with light by erecting a line to connect with the Kiowa-Hartner transmission line.

WASHINGTON, KANS.—The Concordia Electric Light Company, Concordia, Kans., was granted a twenty-year franchise to furnish electric light and power to the city of Washington.

KEARNEY, NEB.—Central Power Company is arranging to supply electric power to Shelton, Neb.

RIVERTON, NEB.—Bonds recently were voted and the money thereby raised will be for installing a lighting plant.

WAYNE, NEB.—Improvements, including better electric lighting, are to be made at the Normal School. The State Board will spend $30,000.

SOUTH CENTRAL STATES.

ASHLAND, KY.—The city will receive bids until August 6 for the installation of an ornamental street-lighting system, in accordance with plans and specifications by F. W. Gesling, city engineer.

JACKSON, KY.—Hugh Mallet and associates are planning for the construction of a local feed mill. Electric equipment will be installed for operation.

CLARKESVILLE, TENN.—The Young Men's Club is organizing a movement looking toward installation of a white way system in the downtown section. The cost is estimated at about $5,000.

MEMPHIS, TENN.—Plans are under way for the consolidation of the Merchants' Power Company and the Consolidated Gas & Electric Company.

MEMPHIS, TENN.—Application for charter for the Millington Light & Power Company, capitalized at $20,000, was filed in the office of the County Register. The incorporators are: W. C. Hill, C. M. Hill, F. M. Hill, O. A. Wilkinson and Eugene Woods.

DATES AHEAD.

Association of Iron and Steel Electrical Engineers. Eleventh annual convention, Philadelphia, Pa., Bellevue-Stratford Hotel, September 10 to 14. Secretary, J. F. Kelly, National Tube Company, McKeesport, Pa.

Association of Railway Telegraph Superintendents. Annual convention, Hotel Raleigh, Washington, D. C., September 10 to 13. Secretary, W. L. Connelly, Gibson, Ind.

International Association of Municipal Electricians. Annual convention, Niagara Falls, N. Y., September 11 to 14. Secretary, Clarence R. George, Houston, Texas.

Northwest Section, National Electric Light Association. Annual convention, Spokane, Wash., September 12 to 15. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

American Electrochemical Society. Annual convention, Pittsburgh, Pa., October 3 to 6. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electrical Contractors' Association of the United States. Annual convention, New Orleans, La., October 10 to 13. Secretary, H. C. Brown, Utica, N. Y.

BATESVILLE, ARK.—The City Council has authorized the Board of Commissioners to borrow $25,000 for improving the light and water plant.

FAYETTEVILLE, ARK.—Offices of the Middle West Gas & Electric Company were moved to this city. The company has purchased the property of the Springdale Light & Power Company and will supply current at Fayetteville for this place; also Springdale and Rogers. This will require an expenditure of about $75,000 for machinery and transmission lines.

FORT SMITH, ARK.—The Coal District Power Company will build transmission lines, connecting a number of towns in this locality and develop the mines and various commercial industries. The Fort Smith Light & Traction Company, owned and operated by the H. M. Byllesby Company of Chicago, will supply current from its central plant at Fort Smith. The company, in order to supply the demands, will either erect another central station or increase the capacity of the present power house. This project will require the expenditure of about $350,000.

MENA, ARK.—J. E. Williams has sold the Hatfield telephone exchange to Alonzo Hall at Hatfield.

RUSSELLVILLE, ARK.—The Arkansas Light & Power Company is installing a 1,000-horsepower turbine generator set at the local plant.

WESSON, ARK.—The Elliott & Bradley Telephone Company has bought the Tatum Telephone Exchange, and the two systems will be merged.

ALVA, OKLA.—Alva Light & Power Company will put in some new equipment to increase capacity of plant.

COMANCHE, OKLA. — E. W. Galloway, of the Consumers Light & Power Company, has submitted a proposal to the Council to purchase the municipal light and water system.

MANGUM, OKLA.—The city has closed a contract with a Kansas City firm for the installation of an electric light plant to cost about $50,000. Equipment will include two oil-burning engines, of 150 and 200 horsepower for operating generators.

NEWKIRK, OKLA.—The power plant was wrecked by a tornado July 18.

ROCKY, OKLA.—Bonds, amounting to $15,000, were voted. Proceeds will be used to purchase the electric light plant and to put in water works.

STILLWATER, OKLA. — Bonds, amounting to $6,000, have been voted, and a new boiler for the electric light and water plant will be installed.

WILSON, OKLA.—Bonds were voted in amounts of $10,000 for electrical installations, and $25,000 for water works. Denham Engineering Company, Oklahoma City, will do the engineering; C. W. Henson is city clerk.

ALVIN, TEXAS.—The Alvin Light & Ice Company, which has been incorporated with a capital stock of $15,000, will build an electric light and ice plant. C. A. Leavens is a stockholder.

BEEVILLE, TEXAS.—The City Council has awarded the contract to John S. Fenner for the construction of a municipal electric light and water works plant to cost $55,000. An injunction to restrain the carrying out of the contract was applied for by local citizens and granted temporarily, pending a hearing of the case. At present the Texas Gas & Electric Company is serving the city with light, power and water.

CELESTE, TEX.—The Celeste Telephone Company has been chartered with a capital stock of $15,000. W. E. Braly, J. W. Ewing and A. W. Ewing are incorporators.

HOUSTON, TEX.—The Houston Light & Power Company has contracted to supply 400 horsepower to operate motors in the Houston plant of the Texas Chemical Company, a subsidiary of the Stauffer Chemical Company. This power company has also arranged to deliver 200 to 400 kilowatts to the Texas Portland Cement Company at Houston.

PORT LAVAGA, TEX.—The County Court is prepared to grant franchise for electric light plant and water works. Address the mayor.

WESTERN STATES.

BEAR CREEK, MONT.—The International Coal Company's power house here was destroyed by fire.

BUTTE, MONT.—Montana Power Company, it is reported, will build 14 miles

of electric railway. F. M. Kerr is general manager.

CARRIZOZO, N. MEX.—An additional telephone line will be built between here and El Paso and between Alamogordo and El Paso by the Mountain States Telephone Company.

YUMA, ARIZ.—A franchise has been granted E. F. Sanguinetti and F. L. Ewing for the lighting of this city.

RENO, NEV.—Nevada Valleys Power Company, which serves the towns of Lovelock, Rochester and Packard from its plant at Lahontan, will extend its power lines into Washoe County, to connect with lines of Truckee River General Electric Company. Report is that former company will build a hydroelectric plant on the Truckee River. This company is controlled by Oakland, Cal., people.

VIRGINIA CITY, NEV.—The Nevada Valleys Power Company has filed an application for a franchise for maintaining an electric lighting service in this city.

WINNEMUCCA, NEV. — Goldbanks Quicksilver Mining Company will rebuild its reduction plant, recently destroyed by fire. W. G. Adamson is president.

BOISE, IDAHO.—The Idaho Power Company has been given a certificate of public convenience and necessity by the Utilities Commission for the building of an electric light system in the town of Kimberly, Idaho.

CENTRALIA, WASH.—R. Thomas, Portland, Ore., president of Thomas Pulp & Paper Company, has announced that he will erect a power plant at Centralia and paper mill at Aberdeen, Wash. The power plant will be steam-electric, the local lignites to be used as fuel.

EVERETT, WASH.—Washington Coast Utilities has been granted a franchise by the county for use of roads for pole and pipe lines, whereby to supply light and power to Arlington and to farmers in the northern part of county.

SEATTLE, WASH.—The City Council has authorized extensions to the municipal street railway lines at a cost of about $500,000.

ALBANY, ORE.—An election will be held to vote on the question of issuing $250,000 in bonds for the purchase of the water plant owned by Oregon Power Company.

ANTIOCH, CAL.—The Western Pacific is negotiating for the purchase of the Oakland-Antioch and the Northern Electric Railway lines, with the intention of extending the Oakland-Antioch line from Pittsburg to Stockton, via Antioch.

AUBURN, CAL.—Bear River Water & Light Company is being organized to build a hydroelectric plant.

FULLERTON, CAL.—A petition has been submitted to the Board of Supervisors of La Habra to establish a lighting system in that place.

HEALDSBURG, CAL.—The city attorney has notified the California Light & Telephone Company of the city's intention to advertise the sale of a franchise for maintaining a telephone service.

LOS ANGELES, CAL.—The Davidson Construction Company has been awarded a contract for installing a power house in the rear of the new Coulter building, to cost $9,960.

MARIPOSA, CAL.—The San Joaquin Light & Power Company has the franchise for furnishing light to this city.

MARTINEZ, CAL.—The Pacific Electric Metal Company has begun the erection of its manufacturing plant.

SAN FRANCISCO, CAL.—The California Railroad Commission has issued an order granting the Vallejo Light & Power Company a certificate of public convenience and necessity to operate in Solano County.

SAN FRANCISCO, CAL.—The Siskiyou Telephone Company has filed with the California Railroad Commission an application for authority to acquire, under a special-use permit, four telephone lines of the Forest Service, U. S. Department of Agriculture.

SANTA ANA, CAL.—An ordinance has been adopted by the Board of Supervisors granting the Pacific Electric Railway a franchise to operate in Orange County.

HONOLULU, T. H.—Congress has appropriated the $80,000 for the lighting of the entrance of the entire channel of Pearl Harbor. As soon as the plans have been drawn up and approved, bids will be advertised for.

INCORPORATIONS

COKEVILLE, WYO.—The Cokeville Telephone Company has been incorporated with a capital of $5,000.

CALDWELL, N. J.—Cole & Morgan, Inc. Nominal capital, $5,000. To act as electrical and mechanical engineers. Incorporators: A. D. Cole, Caldwell; A. P. and A. G. Morgan, Montclair.

BROOKLYN, N. Y.—Samuel L. Richman Construction Company. Nominal capital, $5,000. To operate as electrical contractors. Incorporators: Samuel L. Richman, Coney Island; J. Glennen and J. Tobin.

NEW YORK, N. Y.—Mutry & Cook International Transmitter Company. Nominal capital, $5,000. To manufacture telegraphic transmitting devices. Incorporators: J. Mutry, A. S. and W. A. Cook, 15 Jerome Street, Brooklyn.

NORFOLK, VA.—The Reliance Electric Company. Capital, $50,000. To manufacture electrical fixtures. Incorporators: F. W. Sharp and W. J. Cannon.

HUNTINGTON, TEX.—The Huntington Telephone Company has been chartered with $4,000 capital stock by R. P. McKewen, W. T. Stewart, J. W. Buckner and others.

QUAPAW, OKLA.—Grand River Electric Company incorporated with a capital of $3,000 by G. C. Knight, Quapaw, D. F. Butler, Joplin, and Carl L. Rogers, Oklahoma City.

ST. LOUIS, MO.—St. Louis & East St. Louis Interurban Railway Company, East St. Louis. Capital, $2,500. To construct an interurban line from East St. Louis to St. Louis, Mo. Incorporators: William P. Launtz, Clyde Allen, Albert B. Meints, William B. Tate.

CHICAGO, ILL.—Municipal Electric Company, Chicago. Capital, $2,500. Incorporators: Louis Goldberg, Jacob Jaffee and Sam Grochowsky.

MADISON, WIS.—The Wisconsin Gas & Electric Company of Racine has filed an amendment to its articles of incorporation in the office of the secretary of state, increasing its capital stock from $2,750,000 to $3,350,000.

HENRYETTA, OKLA.—Henryetta Public Service Company of Henryetta. Capital stock, $200,000. Incorporators: J. R. Watson, A. W. Anderson and Harlan Reed, Okmulgee.

OLYMPIA, WASH.—The Northwest Power & Light Company has been incorporated here with a capital stock of $200,000.

NEW YORK, N. Y.—Schrock & Squires, Inc. Nominal capital, $5,000. To engage as electrical engineers. Incorporators: J. J. O'Connor, F. W. Bain and W. B. Nealis, 291 Pearl Street.

NEW YORK, N. Y.—General Radio Corporation. Capital, $20,000. To manufacture special radio apparatus. Incorporators: E. F. Chandler, D. Westreich and J. M. Kornfield, 206 Broadway.

GROTON, N. Y.—Groton Electrical Devices, Inc. Capital, $105,000. To manufacture electrical machinery for heating and drying. Incorporators: D. J. Watrous and B. and J. Conger, Groton.

NEWARK, N. J.—Standard Tungsten Corporation. Capital, $100,000. To manufacture tungsten lamps and specialties. Incorporator: R. T. Rodger and G. Daset.

SCRANTON, PA. — North Mahoning Township Electric Company, West Mahoning Township Electric Company, South Mahoning Township Electric Company, Wayne Township Electric Company, Cowanshannock Township Electric Company and Perry Township Electric Company. Each with capital of $50,000. To operate in Jefferson and neighboring counties. John P. Rawson, treasurer.

LARKSVILLE, PA.—The Carroll Company. Capital, $25,000. To operate electric properties, including a local street-lighting system. Incorporators: John A. Carroll, Thomas J. Breman and R. J. Walsh, all of Larksville.

PITTSBURGH, PA.—Duquesne Electric & Manufacturing Company. Capital, $50,000. To manufacture electric machinery and specialties. E. A. Casey, principal incorporator.

DOVER, DEL.—Abell-Howe Company. Capital, $50,000. To manufacture electrical and mechanical specialties. Incorporators: C. L. Rimlinger and Henry M. Robinson, Wilmington; and Clement M. Egner, Elkton, Md.

GREY CLIFF, MONT.—The Bridger Creek Telephone Company has been incorporated in this city.

FRESNO, CAL.—The Electric Laboratories, Inc., have been incorporated by D. K. Cawyer, L. L. Davenport and C. E. Davenport for $10,000.

LANCASTER, WIS.—Lancaster Light & Power Company. Amendment increasing capital stock from $25,000 to $300,000.

WARREN, OHIO.—The Sunlight Electric Manufacturing Company, Warren; $50,000; C. H. Mills, C. N. Sadler, C. L. Wood, R. B. Wick, Maud E. Gilmer and D. R. Estabrook.

MILLBORO, S. D.—Homesteaders Mutual Telephone Company, Millboro, Tripp county. Capital, $700. Incorporators: T. P. Ward, Henry F. Carlson, M. W. Jerre.

CHICAGO, ILL.—Dearborn Electrical Construction Company, Chicago. Capital, $10,000. Incorporators: Charles S. Knudson, Fred H. Bowen, Leon J. Edelman.

AKRON, O.—The Electric Motor and Repair Company, Akron; $10,000; S. W. Sweet, Henry Kish, R. S. Whitright, W. A. Heffelman, Maude Chamberlin.

SHERIDAN, ILL. — Sheridan Electric Light & Power Company, Sheridan. Capital, $3,000. Incorporators: C. H. Weston, Elmer J. Clark, E. D. Robinson, A. Christensen, E. S. Erickson.

HUNTINGTON, TEX.—Huntington Telephone Company. Capital stock, $4,000. Incorporators: R. P. McKewen, W. T. Stewart, J. W. Buckner and others.

SHERIDAN, ILL.—The Sheridan Electric Light & Power Company has been incorporated with a capital stock of $3,000. C. H. Weston, secretary.

GIBSONBURG, O. — The Gibsonburg Electric Light Company, incorporated with a capital stock of $40,000, and the Gibsonburg Telephone Company, capitalized at $75,000, have been organized by A. H. Miller, N. B. Ervin, C. B. Snyder and others, to provide electric and telephone facilities for the town and vicinity.

WARREN, O.—The Sunlight Electric Manufacturing Company has been incorporated with a capital of $50,000. C. H. Mills.

ALBANY, N. Y.—The Seneca Electric Furnace Corporation. Capital, $100,000. To manufacture electric furnaces. Incorporators: P. and E. Corning and F. W. Cameron.

PHILADELPHIA, PA.—Bound Brook Engine & Manufacturing Company. Capital, $300,000. To manufacture engines, electrical apparatus, etc. Incorporators: Wray C. Arnold, Root C. Finder and H. Folfenden, Philadelphia.

CLINCHFIELD, TENN.—Clinchfield Hydroelectric Power Company. Capital, $50,000. To operate a local electric light and power system. Incorporators: E. K. Baldwin, John A. Thompson and M. P. Beasley.

PULASKI, TENN.—Pulaski Electric & Water Company. Capital, $50,000. To operate local electric and other utilities. Incorporators: C. O. Lindsay, George B. Adams and S. W. Alley, all of Chattanooga.

CHICAGO, ILL.—Kelso Burnett Electric Company, Chicago. Capital increased from $1,000 to $20,000.

SPRINGFIELD, ILL.—The Springfield Electric Company, Springfield. Capital, $2,500. Incorporators: Allen H. Frost, Kirk L. Bly, Edson S. Hineline, Ralph E. Wheeler and Roscoe C. Lorentz.

ENSIGN, KANS.—Ensign Telephone Company of Ensign, Gray County. Capital, $10,000.

CLEVELAND, O.—Flashlight & Electrical Manufacturing Company, Cleveland. Capital, $15,000. Incorporators: Richard E. Murphy, Louis J. Rieske, Ernest J. Hileman, L. L. Rood and William C. Schaefer.

CLEVELAND, O.—Portage Light, Heat & Power Company, Cleveland. Capital, $50,000. Incorporators: R. H. Jamison, H. A. Hauxhurst, R. Hall, W. R. Daley, J. H. Kellogg.

INDIANAPOLIS, IND.—Industrial Electric Furnace Company, Indianapolis, Ind. To manufacture and sell electrical and other furnaces. Capital, $500,000. Directors: Charles B. Sommers, Charles B. Fletcher, F. von Schlegell.

CHATTANOOGA, TENN.—Pulaski Electric & Water Company, Chattanooga. To develop water power on rivers and streams. Capital stock, $50,000. In-

corporators: George B. Adams, S. Wattey, C. O. Lindsey, G. W. Erwin, J. C. Stickley.

CINCINNATI, O.—The Milnor Electric Company, Cincinnati. Machinery. Capital, $40,000. Incorporators: L. T. Milnor, J. P. Milnor, H. T. Ritchie, H. B. Machoy and M. Jaquish.

OKLAHOMA CITY, OKLA.—O. K. Storage Battery Company, Oklahoma City. Capital, $100,000. Incorporators: A. F. Fricks, Earl Rueb, C. F. Wilson, Oklahoma City.

MORGANTOWN, W. VA.—The Fry Oil & Gas Company has been incorporated with a capital of $25,000. C. R. Fry, Morgantown, president.

NEW YORK, N. Y.—The Strongson Fire Signal Company. Capital, $20,000. To manufacture fire alarm equipment. Incorporators: H. Strongson, R. W. Thompson and H. R. Sanford, 6 East Thirty-sixth Street.

SYRACUSE, N. Y.—I. G. Jones Company. Capital, $50,000. To manufacture electric machinery, engines and boilers. Incorporators: Ira G. Jones, Hunter H. Betts and Frederick C. Faulkner, Syracuse.

NEW PUBLICATIONS

VOLATILE PRODUCTS OF COAL CARBONIZATION.—The Bureau of Mines has issued Technical Paper No. 140, which is a continuation of the work described in Bureau of Mines Bulletin No. 1 on the character of the volatile matter in coal. Technical Paper No. 140 is by Guy B. Taylor and Horace C. Porter and deals with the chemical reactions which occur when coal is heated with exclusion from oxygen, and analyzes the new substances that appear as the result of such heating. The report contains numerous tables showing the results of this research, and illustrates an apparatus for carbonizing coal in a current of its own gas. The closing paragraphs, giving general conclusions, are highly interesting.

VALUE OF PEAT AS STEAM FUEL.—A report on results of boiler trials, with peat as fuel, at the Fuel Testing Station, Ottawa, Canada, is published in Bulletin No. 17, Canada Department of Mines. The report is by John Blizard, who states that the boiler trials were to obtain information as to the value of peat as a fuel for the production of steam. A Babcock & Wilcox water tube boiler, marine type, was used in these trials. A complete summary of results of three tests is given in tabulated form, and is accompanied by explanatory notes. Other trials were made with portable boilers.

PROPOSALS

STREET-LIGHTING SYSTEM—Bids for the construction and erection of an ornamental street-lighting system at Ashland, Ky., will be received until August 6 by F. W. Gesling, city engineer.

ELECTRIC LIGHT EQUIPMENT—Sealed bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 30 for electric light systems for the foundry and machine shop at the navy yard, Norfolk, Va. Drawings and specification No. 2458 may be obtained on application to the Bureau or to the Commandant at the navy yard named. Address F. R. Harris, chief of bureau.

FINANCIAL NOTES

Nevada-California Electric Corporation reports combined earnings of subsidiary companies for April and four months ended April 30, 1917, as follows: April gross, $152,779; net after tax, $82,161; surplus after charges, $34,272; four months' gross, $553,560; net after tax, $300,808; surplus after charges, $100,002.

The Wisconsin Railroad Commission has authorized the Wisconsin Interurban System, a projected electric interurban railway between Madison and Portage and Madison and Janesville, Wis., to issue $600,000 bonds. A portion of the proceeds will be used to pay indebtedness incurred in constructing existing street railway lines in Portage and Madison, the remainder to be used for construction purposes. J. E. Jones of Madison is president of the company.

The Brooklyn City Railroad Company has declared a quarterly dividend of 2½ per cent, payable July 16 to stock of record July 5. Dividend payments have been at the rate of 8 per cent per annum and the 2½ per cent declaration places the stock on its old dividend basis of 10 per cent per annum.

The earning statement issued by the Commonwealth Power, Railway & Light Company, Michigan, for May shows: Gross earnings of the Commonwealth, 13.85 per cent increase; operating expenses, 33.75 per cent increase; net earnings, 4.21 per cent shrinkage; balance, 54.13 per cent less. The gross earnings for the twelve months ending with May increased 14.64 per cent and the operating expenses increased 25.83 per cent. The net earnings showed a gain of 4.43 per cent and balance 10.64 per cent less.

The Ohio Public Utilities Commission has approved the schedule filed by the Toledo Railways & Light Company, a subsidiary of Cities Service Company, of increased rates ranging from 10 to 20 per cent on commercial and industrial light and power. The change was effective as of July 1 and about 5,000 consumers are affected. Higher costs for fuel and labor made this increase necessary. Rates for domestic service remain unchanged at 7 cents per kilowatt-hour.

Northern Texas Electric Company has declared the regular quarterly dividend of $1 on the common and regular semi-annual dividend of $3 on the preferred stocks. Both dividends are payable September 1 to stock of record August 16.

Kings County Electric Light and Power Company, Brooklyn, N. Y., through its board of directors, has declared a regular quarterly dividend of $2 per share on outstanding capital stock, payable September 1, to stockholders of record at 3 p. m., August 21, 1917.

General Electric Finances.

The $15,000,000 three-year 6 per cent notes sold by the General Electric Company to J. P. Morgan & Co. and Lee, Higginson & Co., are being offered at 99¾ and interest, to yield 6.10 per cent. The following statement has been issued by the General Electric Company:

"The General Electric Company, whose practice it has always been to maintain a strong position with respect to cash assets, has just arranged a loan of $15,000,000 for three years to provide for the demand of a largely increased business. The company expended nearly $9,000,000 upon additional plant facilities during the year 1916, and like expenditures for the present year will be considerably greater. Apart from this, its inventories have naturally greatly increased, and the slowing down of collections in the existing unsettled conditions will result in a more than normal increase in its accounts receivable. The quick assets of the company, as shown by its last annual report, excluding securities, amounted to $97,000,000. Against this, it had indebtedness, excluding current liabilities, of $12,000,000."

Public Utility Dividends.

Edison Electric Illuminating Company of Brockton, Mass., has declared the regular quarterly dividend of $2 a share on the capital stock, payable August 1 to stock of record July 16.

Lowell Electric Light Corporation declared the regular quarterly dividend of $2.50 a share on the capital stock, payable August 1 to stock of record July 18.

Fort Worth Power & Light Company declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable August 1 to stock of record July 20.

Illinois Northern Utilities Company, Chicago, declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable August 1 to stock of record July 20.

Carolina Power & Light Company has declared the regular quarterly dividend of ½ of 1 per cent on the common stock, payable August 1 to stock of record July 24.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller Co., Rookery Bldg., Chicago.

	Div. rate per cent.	Bid July 17.	Bid July 24.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	18	18
Adirondack Electric Power of Glens Falls, preferred	6	73	72
American Gas & Electric of New York, common	10+extra	118	111
American Gas & Electric of New York, preferred	6	48	47½
American Light & Traction of New York, common	..	308	308
American Light & Traction of New York, preferred	6	109	108
American Power & Light of New York, common	4	67	67
American Power & Light of New York, preferred	6	87½	86½
American Public Utilities of Grand Rapids, common	..	28	28
American Public Utilities of Grand Rapids preferred	6	63	64
American Telephone & Telegraph of New York	..	120⅜	120⅞
American Water Works & Elec. of New York, common	..	8	7¾
American Water Works & Elec. of New York, particip.	7	22	23
American Water Works & Elec. of New York, first preferred	..	77½	69
Appalachian Power of Bluefield, common	..	5	4½
Appalachian Power of Bluefield, preferred	7	30	30
Cities Service of New York, common	6+extra	275	274
Cities Service of New York, preferred	6	84½	85
Commonwealth Edison of Chicago	8	120	121½
Comm. Power, Railway & Light of Jackson, common	4	48	48
Comm. Power, Railway & Light of Jackson, preferred	6	76	76
Federal Light & Traction of New York, common	..	11	12
Federal Light & Traction of New York, preferred	..	43	44
Illinois Northern Utilities of Dixon	6	78	78
Middle West Utilities of Chicago, common	2+2 extra	40	42
Middle West Utilities of Chicago, preferred	6	70	70
Northern States Power of Chicago, common	7	93	89
Northern States Power of Chicago, preferred	7	96	96½
Pacific Gas & Electric of San Francisco, common	5	55	54½
Pacific Gas & Electric of San Francisco, preferred	6	88	89
Public Service of Northern Illinois, Chicago, common	7	92	92½
Public Service of Northern Illinois, Chicago, preferred	6	98½	97
Republic Railway & Light of Youngstown, common	4	30½	32¾
Republic Railway & Light of Youngstown, preferred	6	65	64
Standard Gas & Electric of Chicago, common	..	9½	9⅛
Standard Gas & Electric of Chicago, preferred	6	34½	35
Tennessee Railway, Light & Power of Chattanooga, common	..	6	5¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	30	29
United Light & Railways of Grand Rapids, common	4	39	40
United Light & Railways of Grand Rapids, preferred	6	68	68
Western Power of San Francisco, common	..	14	13½
Western Power of San Francisco, preferred	6	53	54
Western Union Telegraph of New York	extra	92⅞	93¾
Industrials—			
Electric Storage Battery of Philadelphia, common	4	61	60½
General Electric of Schenectady	8	157	154½
National Carbon of Cleveland, common	8	79⅝	79⅜
National Carbon of Cleveland, preferred	..	130⅝	Last sale
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	49½	48¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	65	65

The Milwaukee Electric Railway & Light Company has declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable July 31 to stock of record July 20.

Reports of Earnings.

WESTERN UNION TELEGRAPH.

The earnings report for six months ended June 30, 1916 and 1917 respectively, with month of June, 1917, estimated, is as follows:

	1917.	1916.
Total revenues	$36,422,757	$29,244,150
Maintenance repairs and reserved for depreciation	$ 4,468,524	$ 3,930,650
*Other operating expenses, including rent of leased lines and taxes	24,462,681	18,668,462
Total expenses	$28,931,205	$22,599,112
Balance	$ 7,491,552	$ 6,645,038
Deduct interest on bonded debt	665,925	665,925
Net income	$ 6,825,627	$ 5,979,113

*Includes special payments to employes for first half of 1917.

AMERICAN TELEPHONE & TELEGRAPH COMPANY.

Earnings report for six months ended June 30, 1917:

Earnings:	1916.	1917.
Dividends	$13,253,106.08	$13,968,644.00
Interest and other revenue from associated companies	6,874,308.74	8,580,213.71
*Telephone traffic (net)	4,197,037.32	4,754,480.13
Other sources	859,577.94	1,136,824.41
Total	$25,184,630.08	$28,440,162.25
Expenses	2,725,155.38	3,672,813.93
Net earnings	$22,458,874.70	$24,767,348.32
Deduct interest	3,287,791.67	5,171,443.22
Balance	$19,171,083.03	$19,595,905.10
Dividends paid	15,425,007.88	15,839,804.64
Balance	$ 3,746,075.15	$ 3,756,100.46

*One month estimated.

BELL TELEPHONE SYSTEM IN UNITED STATES.

American Telephone & Telegraph Company and associated companies in the United States, not including connected independent or sub-licensee companies, report earnings for five months ended May 31, 1917, as follows:

(All duplications, including interest, dividends and other payments to American Telephone & Telegraph Company by associated companies, are excluded.)

	1916.	1917.
Exchange revenues	$ 76,464,365	$ 85,331,993
Toll revenues	27,943,645	33,555,372
Miscellaneous revenues	1,092,118	1,190,460
Total operating revenues	$105,500,128	$120,077,825
Depreciation	$19,604,376	$22,029,670
Current maintenance	13,416,901	15,797,516
Traffic expenses	21,072,445	25,946,157
Commercial expenses	10,465,035	11,591,818
General and miscellaneous expenses	4,585,460	5,510,732
Total operating expenses	$69,144,217	$80,875,893
Net operating revenues	$36,355,911	$39,201,932
Uncollectible revenues	$ 678,174	$ 548,028
Taxes	5,830,429	7,425,567
Operating income	$29,847,308	$31,228,337
Net non-operating revenues	2,904,202	3,316,974
Total gross income	$32,751,510	$34,545,311
Rent and miscellaneous deductions	$ 1,469,348	$ 1,621,492
Interest deductions	7,748,633	8,950,225
Total deductions	$ 9,217,981	$10,571,717
Balance net income	$23,533,529	$23,973,594
Deduct dividends (paid for three months and estimated for two months)	14,448,384	15,009,140
Surplus earnings	$ 9,085,145	$ 8,964,454

	Total May 31, 1916.	Total May 31, 1917.
Miles of wire (owned)	18,905,218	20,870,194
Bell stations (owned)	6,240,654	6,865,880
Bell connected stations	3,223,146	3,390,188
Total stations	9,463,800	10,256,068

Electrical Patents Issued July 10, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,232,477. Switch-lock. J. Atkins, Philadelphia, Pa. Details of combination controlled push buttons.

1,232,478. Controller-operating Device for Vehicles Having Electric Transmission. W. C. Baker, Lakewood, Ohio, assignor to Entz Motor Patents Corporation. Pedal-operated drum arrangements.

1,232,496. Call-Distributing System. H. P. Clausen, assignor by mesne assignments to Western Electric Co., Inc., New York, N. Y. For telephone systems.

1,232,497. Telephone-exchange System. H. P. Clausen, assignor by mesne assignments to Western Electric Co., Inc. Special arrangement of supervisory signal.

1,232,498. Automatic Testing System. H. P. Clausen, assignor to Western Electric Co., Inc. For indicating unstandard conditions on telephone lines.

1,232,499. Electric Signaling System. H. P. Clausen, assignor to Western Electric Co., Inc. Wheels bearing signaling characters at receiving station are electrically operated through tuned reeds by impulses of current of different characters.

1,232,507. Telephone-exchange System. H. L. Darrah, assignor to Western Electric Co., Inc. Arrangement of operator's set in cord circuit.

1,232,512. Magnetic Chuck. L. W. Downes and R. C. Patton, assignors to D. & W. Fuse Co., Providence, R. I. Structure of removable face plate.

1,232,514. Electric Amplifier System. H. C. Egerton, assignor by mesne assignments to Western Electric Co., Inc. For telephone lines.

1,232,515. Receiver-case. H. C. Egerton, assignor to Western Electric Co., Inc. For telephone structures.

1,232,532. Magnetic Chuck. W. S. Griffith, assignor to Heald Machine Co., Worcester, Mass. Has a single-piece cast body.

1,232,548. Device for Coupling a Telegraph Transmitter and Sending-key. C. M. Holmes, Jacksonville, Fla. Plug and socket device with cord.

1,232,561. Block-signal System. M. R. Julian, assignor to Julian Signal Co., Birmingham, Ala. Signal on vehicle has its circuit through ground, when shoe engages track contact and is opened by a time controller.

1,232,580. Selective Controlling System. A. E. Lundell, assignor by mesne assignments to Western Electric Co., Inc. A sender operates switches electromagnetically in accordance with its adjustment.

1,232,581. Substation Telephone Set. A. E. Lundell, assignor to Western Electric Co., Inc. Arrangement of transmitter receiver and impulse-sending mechanism.

1,232,582. Automatic Telephone System. A. E. Lundell, assignor to Western Electric Co., Inc. Arrangement of selector switches, operator's senders, call registers, etc.

1,232,584. Protective Device for Railways. G. W. McMunn, Pittsburgh, Pa. Structure for connecting rails for temporarily controlling block signals.

1,232,596. Ignition-timing Device for Internal-combustion Motors. W. E. Nickerson, assignor to E. D. Chadwick, trustee, Winchester, Mass. Controlled by mechanisms operated in accordance with motor speed and power demanded.

1,232,598. Heating and Ventilating Apparatus. J. K. Nordstrom and G. C. Breidert, Chicago, Ill. Automatic, thermoelectrically controlled.

1,232,599. Motor-starting switch. R. C. Patton, assignor to D. & W. Fuse Co., Providence, R. I. Switch and fuse structure.

1,232,606. Advertising-machine. D. A. Ritchie, assignor to Economy Advertising Co., Centralia, Ill. Arrangement of electric light and reflector in projector.

1,232,624. Electrical Contact Members. H. V. S. Taylor, assignor to Westinghouse Electric & Mfg. Co. Mated vibratory contacts, one of tungsten and the other of silver.

1,232,625. Electrical Contact Members. H. V. S. Taylor, assignor to Westinghouse Electric & Mfg. Co. Contacts are one of tungsten and the other of platinum.

1,232,638. Arc-lamp. T. H. Williams, assignor to The Buda Co., Chicago, Ill. Carbon holding and feeding mechanism.

1,232,642. Lantern. H. A. Woods, Indianapolis, Ind. Flashlight, including two dry cells.

1,232,643. Tie-welding Baling-press. L. B. Wygant, Vincennes, Ind. The ties are electrically welded.

1,232,645. Combination Track-bond and Tie. L. B. Bailey, Yolyn, W. Va. Details of construction.

1,232,646. Elevator-locking Mechanism. H. L. Beck, J. J. Houlahen and J. Weible, Corapolis, Pa. Safety device has gate mechanism interrelated with the motor circuit.

1,232,647. Insulator-switch. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Details of structure mounted on a pair of insulators.

1,232,650. Switch. S. F. Briggs, assignor to Briggs & Stratton Co., Milwaukee, Wis. Structure of rotary snap switch.

1,232,660. Heating Unit. W. H. Dalton, assignor to W. H. Dalton Co., Salem, Mass. Heating evil is embedded in insulating, heat conducting, cementitious substance between two face plates.

1,232,671. Illuminated Torpedo. A. Fernandez, Washington, D. C. Electric searchlight on a non-inflammable torpedo.

1,232,673. Electric Toy Motor. J. M. Fisher, Brooklyn, N. Y. Details of construction.

1,232,710. Storage Battery. R. D. Mowry, Chicago, Ill. Manner of mounting and insulating plates.

1,232,727. Light-varying Apparatus for Printing Mechanisms. P. F. Sperry, assignor to American Cinematograph Co., Chicago, Ill. Structure of film printing machine employing electric light.

1,232,732. Spark-plug. E. L. Suess, Pittsburgh, Pa. Structural details.

1,232,741. Electric Lamp. A. J. West, Winnipeg, Manitoba, Canada. Structure of base of incandescent gas-filled lamp.

1,232,745. Warning-signaling System. F. W. Wood, assignor to Charles Cory & Son, Inc., New York, N. Y. Hand switch starts alternator of frequency to which signal mechanism is tuned.

1,232,774. Electric Railway-crossing Signal. A. L. Davis, Clinton, S. C. Arrangement of train-controlled circuits for effecting operation of the signal for the desired time.

1,232,785. Quartz-glass-making Machine. A. Frost, New York, N. Y. Has an electric melting furnace.

1,232,792. Switch-lock. C. Grimes, assignor of one-half to E. A. Albright, Chicago, Ill. For two-push-button wall switch.

1,232,793. Electric Switch. C. Grimes, assignor of one-half to E. A. Albright, Chicago, Ill. Structure of two-push-button wall switch.

1,232,799. Electric Starting System for Internal-combustion Engines. O. Heins and C. M. Wilds, assignors to Bosch Magneto Co., New York, N. Y. Gearing switches, etc., for starting motor having normally de-centered, axially movable armature.

1,232,824. Portable Flash-light. J. L. Mayhew, Williamstown, Mass. Structural details.

1,232,834. Transformer. L. C. Nichols, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has a moisture-removing compartment through which the oil circulates. (See cut.)

1,232,843. Electrical Resistance Element and Process of Making the Same. M. H. Rice, assignor to National Electric Utilities Corp., New York, N. Y. Comprises carbon base having a protective coating of silicate of alumina and soda fused on.

1,232,858. Train Stop and Signal System. H. G. Sedgwick, L. Bartlett, administrator of H. G. Sedgwick, deceased, assignor to the National Safety Appliance Co. Comprises a local circuit and battery with means for indicating impairment of the battery.

1,232,859. Train Signaling and Stopping System. H. G. Sedgwick, assignor to the National Safety Appliance Co., San Francisco, Cal. Two-track magnets acting on vehicle armature are respectively energized according to the condition of the block ahead.

1,232,860. Train Signaling and Stopping System. H. G. Sedgwick, assignor to the National Safety Appliance Co. A passing train alters the resistance in a local battery circuit.

1,232,861. Train Signaling and Stopping System. H. G. Sedgwick, assignor to the National Safety Appliance Co. A local circuit sends current about a polarized track magnet to neutralize or strengthen it according to condition of block ahead.

1,232,863. Control System. K. A. Simmon and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Phase converters between a single phase source and a polyphase electric machine are controlled by load conditions.

1,232,864. Change-over Mechanism for Electric Railways. K. Smith, Chicago, Ill. Lath for holding trolley depressed controls switch.

1,232,873. Higher - oxid - of - manganese Depolarizer. A. A. Wells, assignor to National Carbon Co., Long Island City, N. Y. For Leclanché cells; comprises oxid higher than dioxid.

1,232,879. Thermionic Amplifying-circuit. P. I. Wold, assignor to Western Electric Co., Inc. For measuring direct current voltages.

1,232,884. Operator's Telephone-circuit. O. E. Benson, assignor to Western Electric Co., Inc., New York, N. Y. Details of circuit arrangements.

1,232,891. Telephone Meter or Register for Measuring Telephone Calls. G. L. Bruschke, Chicago, Ill. Comprises electromagnetically-operated counters.

1,232,903. Interlocking and Door-operating Device for Elevators. E. L. Dunn, Worcester, Mass. Comprises a motor controller on the door, and a door controller on the car.

1,232,904. Manganous Manganate and Permanganate Depolarizing Agent. C. Ellis, assignor to National Carbon Co., Long Island City, N. Y. For dry batteries; a flaky compound of a highly oxygenated acid of manganese.

1,232,908. Light-treatment Apparatus. E. C. Feyrer, assignor of one-half to C. E. Leitzinger, Erie, Pa. Therapeutic device.

1,232,919. Thermionic Voltmeter. R. A. Heising, assignor to Western Electric Co., Inc. Comprises a thermionic rectifier, an indicating instrument in the output circuit and an adjustable electromotive force in the input circuit, the measured voltage being impressed on the input circuit.

1,232,925. Control System. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,232,863.

1,232,937. Attachment for Electric Vibrators. C. B. Lawlor, New York, N. Y. Manner of attaching a gyrating resilient cap to a hand instrument.

1,232,943. Telephone-exchange System. A. E. Lundell, assignor to Western Electric Co., Inc., New York, N. Y. Automatic with provision for reringing the called subscriber at will by the calling subscriber.

1,232,944. Telephone Signaling System. A. E. Lundell, assignor to Western Electric Co., Inc., New York, N. Y. For use between offices.

1,233,029. Electric Signaling Apparatus for Railways. J. E. Colas, Creil, France. Structure and lubrication of signaling rail contacted by apparatus on locomotive.

1,233,031. Connecting-plug. F. D. Cook, assignor to Frank B. Cook Co., Chicago, Ill. For entering jack of telephone line.

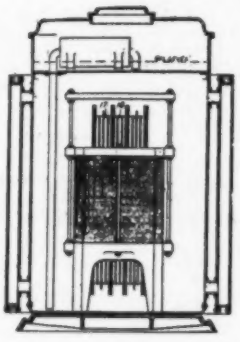
1,233,037. Fire-alarm System for Telephone-exchanges Using Line-distributors. D. G. Dee, assignor by mesne assignments to R. H. Rogers, Rochester, N. Y. Impulse-sending alarm mechanism is combined with automatic telephone system.

1,233,046. Electrical Signaling System. B. F. Gardener, assignor of one-half to S. Stedman, Chicago, Ill. For application to three-wire distribution system.

1,233,062. Automatic Cut-out for Electric Lines. R. Johansson, Gottenborg, Sweden. Electromagnetic cut-out plug.

1,233,082. Vehicle-lamp. C. McKeever, assignor of one-third to W. H. Dickinson and one-third to C. B. Mears, New York, N. Y. Structure of headlight with shield preventing direct vision of filament.

1,233,088. Gear-shifting Mechanism. G. B. Maegly, Kansas City, Mo. Electromagnetically-controlled fluid pressure device.



No. 1,232,834.—Transformer.

1,233,097. Quick-break Switch. R. K. Mason, assignor to Trumbull-Vanderpoel Electric Mfg. Co. Knife-blade type.

1,233,098. Locking Electrical Switch. C. B. Meuser and J. G. Breithhaupt, Ashland, Ohio. Special structure with permutation lock. (See cut.)

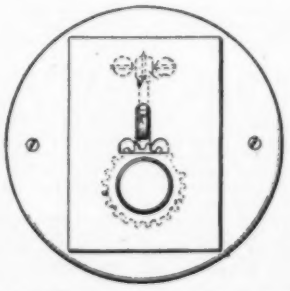
1,233,122. X-Ray Apparatus. E. Pohl, Kiel, Germany. Method for internal irradiation of the human body.

1,233,133. Permutation-switch. C. A. Short and H. C. Dunning, assignors to Auto Protection Co., Los Angeles, Cal. Circuit is disabled if switch elements are not operated in a certain order.

1,233,137. X-Ray System. H. C. Snook, Philadelphia, Pa. Manner of supplying direct current to tube from high-potential alternating source.

1,233,148. Piano Attachment for Operating Musical Instruments. P. von Rohl, assignor of one-third to P. Lasrich and one-third to E. Fruhner, New York, N. Y. Comprises electromagnetic control of pneumatics for operating an additional instrument from the keyboard of one.

1,233,183. Electrical Heating Unit and Method of Making the Same. W. A. Carter and S. Crocker, assignors to General Electric Co. A resistance grid comprising parallel ribbons is stamped integral from sheet metal and bent into form.



No. 1,233,098.—Locking Electric Switch.

1,233,188. Outlet-box Fitting. A. Coggeshall and H. C. Schnake, assignors to the Bryant Electric Co., Bridgeport, Conn. Is provided with terminals for receiving jacks for an attachment plug.

1,233,189. Direction-indicator. M. Colby, Mount Horeb, Wis. For vehicles; electromagnetically operated.

1,233,191. Resistance Unit and Method of Making the Same. E. F. Collins, assignor to General Electric Co. Modification of No. 1,233,183.

1,233,192. Cut-out for Electrical Circuits. N. J. Conrad, assignor to Schweitzer & Conrad, Inc., Chicago, Ill. Structure of enclosed fuse.

1,233,196. Automatic Ringing and Secret Service Telephone System. H. D. Currier, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Details of link circuits.

1,233,197. Electric Terminal. J. Cuthbert, Chicago, Ill. Binding post.

1,233,199. Signaling System. P. L. E. del Fundo-Giera, New York, N. Y. Circuit is controlled by buoy actuated by passing vessel.

1,233,204. Electric Battery. J. E. Dunn, assignor to Novo Mfg. Co., New York, N. Y. Arrangement of plurality of dry cells in a container.

1,233,211. Device for Telegraphing Under Water. F. P. Fisher and H. Dehart, Radford, Va. Apparatus is connected to submerged, spaced electrodes.

1,233,220. Electromagnetic Organ-action. J. A. Godryez, Philadelphia, Pa. Valve admitting air from wind box to pipe is electromagnetically controlled.

1,233,231. Circuit-closer. J. F. Hawley and F. L. Moss, Chillicothe, Mo. Telescoping sections carrying contacts are spring-pressed apart.

1,233,232. Wind-wheel Electric Generator. A. H. Heyroth, Geraldine, Mont. The rotor is an inductor carrying wind wheel.

Reissues.

14,326. Absolute Permissive Automatic Block-Signal System. W. W. Salmon and L. Dodgson, assignors to General Railway Signal Co., Gates, N. Y. Circuit details.

Patents Expired.

The following United States electrical patents expired July 24, 1917:

654,130. Electric Steering Gear. H. W. Buck, Schenectady, N. Y.

654,138. Electric Current-grounding Device for Fire-Extinguishing Apparatus. W. A. Dennett, Springfield, Mass.

654,142. Brake. Gano S. Dunn, East Orange, N. J.

654,187. Electrical Safety Fuse. A. L. Stevens, New York, N. Y.

654,208. Incandescent Electric Lamp. S. D. Washburn, Boston, and Clarence H. Tinkham, Cambridge, Mass.

654,239. Electric Switch. W. Ely, Providence, R. I.

654,277. Electric Arc Lamp. H. Pieper, Fils, Liege, Belgium.

654,299. Starting Mechanism for Alternating-current Motors. J. J. Wood, Fort Wayne, Ind.

654,310. Junction or Connection Box. R. Hundhausen, Wilmerdorf, Germany.

654,320. Electric Heater. R. R. Morison, San Francisco, Calif.

654,325. Automatic Switch for Electric Car-lighting Apparatus. W. F. Richards, Buffalo, N. Y.

654,326. Voice-concealing Attachment for Telephones. H. P. Roberts, Boston, Mass.

654,341. Damping Device for Recording Instruments. W. H. Bristol, Hoboken, N. J., and F. D. Bristol, Naugatuck, Conn.

654,348. Trolley Harp. E. G. Johnson, Brigantine, N. J.

654,355. Electric Gas Lighter. J. Y. Parke, Philadelphia, Pa.

654,367. System of Distribution. E. Thomson, Swampscott, Mass.

654,390. Induction Coil. R. A. Fessenden, Allegheny, Pa.

654,391. Locking Device for Armature Oil Guards. A. J. Gairing, Johnstown, Pa.

653,410. Apparatus for Controlling Electric Motors. F. A. Merrick and Emmett W. Stull, Johnstown, Pa.

654,433. Incandescent-lamp Socket. W. B. Bragdon, Cumberland Mills, Me.

654,448. Trolley Base. H. S. Goughnour, Johnstown, Pa.

654,463. Electric Furance. H. Leleux, Paris, France.

654,468. Electric Metering System. F. E. Town, Glencarlyn, Va.

654,519. Secondary Battery. C. J. Coleman, Chicago, Ill.

654,520. Secondary Battery. C. J. Colemen, Chicago, Ill.

654,531. Electric Bell. C. H. Fergason, Binghamton, N. Y.

654,551. Means for Regulating Electric Motors. R. Lundell, New York, N. Y.

654,557. Secondary Battery. D. Tommasi, Paris, France.

654,574. Trolley Track for Electric Railways. V. Koch, Scranton, Pa.